Joint Panel Report
EUB Decision 2004-005

Canadian Natural Resources Limited

Application for an Oil Sands Mine, Bitumen Extraction Plant, and Bitumen Upgrading Plant in the Fort McMurray Area

January 27, 2004

Joint Review Panel Established by the Alberta Energy and Utilities Board and the Government of Canada

EUB

Canada

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REPORT OF THE JOINT REVIEW PANEL ESTABLISHED BY THE ALBERTA ENERGY AND UTILITIES BOARD AND THE GOVERNMENT OF CANADA
EUB Decision 2004-005: Canadian Natural Resources Limited, Application for an Oil Sands Mine, Bitumen Extraction Plant, and Bitumen Upgrading Plant in the Fort McMurray Area
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EXECUTIVE SUMMARY

Canadian Natural Resources Limited (CNRL) filed Application No. 1273113 with the Alberta Energy and Utilities Board (EUB), pursuant to Sections 10 and 11 of the Oil Sands Conservation Act, for approval for an oil sands mine, a bitumen extraction plant, and a bitumen upgrader and associated facilities. The project, designed to produce approximately 37 000 cubic metres per day of upgraded bitumen product, would be located approximately 70 kilometres north of Fort McMurray. Project construction would commence in 2004, with initial production in 2007 and full production by 2011.

The project required an environmental assessment under the Canadian Environmental Assessment Act (CEAA). On June 26, 2003, the federal Minister of Fisheries and Oceans referred the environmental assessment of the project to a review panel. On August 18, 2003, Canada and the EUB entered into an agreement to establish a joint environmental assessment panel (the Panel) for the project. Under the agreement, the Panel was charged with fulfilling the review requirements of both CEAA and the Energy Resources Conservation Act (ERCA).

The Panel considered Application No. 1273113 at a public hearing held in Fort McMurray, Alberta, during September 15-19, 22-26, and 29, 2003. Participants who provided evidence at the hearing included CNRL and other oil sands developers, First Nations and local aboriginal groups, local residents, nongovernment environmental groups, a local medical staff association, and representatives from both provincial and federal regulatory agencies. While participants raised a number of issues for the Panel to consider, most issues centred on the environmental impacts of the project and the socioeconomic impacts of rapid industrial development.

Having regard for its responsibilities under ERCA and CEAA, the Panel carefully considered all of the evidence pertaining to Application No. 1273113. The Panel finds that CNRL's project is in the public interest and the Panel is prepared, subject to the approval of the Lieutenant Governor in Council, to approve Application No. 1273113. Furthermore, the Panel concludes that the project is unlikely to result in significant adverse environmental effects, provided that the mitigation measures proposed by CNRL and the recommendations of the Panel are implemented.

In approving Application No. 1273113, the Panel set out conditions relating to mining operations, resource conservation, and tailings management. In addition, the Panel also made recommendations to the federal and provincial governments that would aid in the mitigation of the environmental effects of the project and in the need for follow-up measures.

This executive summary is provided for the benefit of the reader and does not form part of the report. All persons making use of the executive summary are reminded that the report should be consulted for all purposes relating to the interpretation and application of the Panel's views.

HORIZON OIL SANDS PROJECT JOINT REVIEW PANEL
Calgary Alberta

CANADIAN NATURAL RESOURCES LIMITED
APPLICATION FOR AN OIL SANDS MINE,
BITUMEN EXTRACTION PLANT, AND
BITUMEN UPGRADING PLANT
IN THE FORT MCMURRAY AREA

Decision 2004-005
Application No. 1273113

1 DECISION AND RECOMMENDATIONS TO CANADA AND ALBERTA

Having regard for its responsibilities under the Energy Resources Conservation Act (ERCA) and the Canadian Environmental Assessment Act (CEAA), the joint Canada and Alberta Energy and Utilities Board (EUB/Board) review panel (the Panel) has carefully considered all of the evidence pertaining to the application and finds that Canadian Natural Resources Limited's (CNRL's) project is in the public interest for the reasons set out in this report. Therefore, under its mandate through the EUB, the Panel is prepared, subject to the approval of the Lieutenant Governor in Council, to approve Application No. 1273113. The Panel's approval is subject to the conditions listed in Appendix 1. The Panel expects that CNRL will adhere to all commitments it made during the consultation process, in the application, and at the hearing to the extent that those commitments do not conflict with the terms of any approval or licence affecting the project or any law, regulation, or similar requirement CNRL is bound to observe.

With regard to its responsibilities as set out under CEAA and to the Panel's terms of reference, the Panel concludes that the project is unlikely to result in significant adverse environmental effects, provided that the mitigation measures proposed by CNRL and the recommendations of the Panel are implemented.

The Panel recommends to Canada that

- the Department of Fisheries and Oceans (DFO) require CNRL to gather additional hydrologic data and to verify the predictions of its hydrologic model (Section 13.10);
- DFO assess the need to integrate the findings of the Instream Flow Needs (IFN) subgroup of the Cumulative Environmental Management Association (CEMA) into its authorizations (Section 13.10);
- DFO, in cooperation with Alberta Environment (AENV), establish an IFN for the Athabasca River in the event that CEMA is unable to do so by the end of 2005 (Section 13.10);
- DFO require CNRL to develop and implement a comprehensive surface water quality and sediment quality monitoring program (Section 14.6);
- DFO require CNRL to share monitoring results of its compensation lake with other stakeholders in the region (Section 15.6);
- DFO require CNRL, in consultation with Environment Canada (EC), to develop and implement a comprehensive fish-monitoring program (Section 15.6);

- DFO require CNRL to conduct follow-up studies on potential impacts of fish tainting compounds from the project on relevant fish species (Section 15.6);
- Health Canada (HC), in cooperation with Alberta Health and Wellness (AHW), consider undertaking a regional health study primarily dealing with First Nations, Metis, and other aboriginal people (Section 18.6); and
- EC and DFO review and optimize their financial and human resourcing of CEMA with a view to produce results in an earlier time frame (Section 20.6).

The Panel recommends to Alberta that

- AENV invite all interested stakeholders to participate in the process of assessing the need for a regional groundwater resource characterization initiative (Section 12.7);
- AENV's Dam Safety Branch require CNRL to include updated seepage modelling results, Quaternary deposits mapping, groundwater monitoring plans, and mitigation measures as part of the external tailings area (ETA) detailed design report (Section 12.7);
- AENV consider the involvement of stakeholders, in particular EC, in the design and implementation of CNRL's groundwater monitoring program (Section 12.7);
- AENV require CNRL to gather additional hydrologic data and to verify predictions of its hydrologic model (Section 13.10);
- AENV, in cooperation with DFO, establish an IFN for the Athabasca River in the event that CEMA is unable to do so by the end of 2005 (Section 13.10);
- AENV assess the need to integrate the findings of the IFN subgroup of CEMA into its authorizations (Section 13.10);
- AENV require CNRL to monitor for the effects of acid deposition in regional water bodies (Section 14.6);
- AENV require CNRL to develop and implement a comprehensive surface water quality and sediment quality monitoring program (Section 14.6);
- AENV and Alberta Sustainable Resource Development (ASRD) require CNRL to conduct follow-up studies on potential impacts of fish tainting compounds on relevant fish species (Section 15.6);
- AENV and ASRD require CNRL, in consultation with EC, to develop and implement a comprehensive fish-monitoring program (Section 15.6);
- ASRD and AENV identify wetlands research as a priority for CEMA to address and consider requiring CNRL to develop and initiate a program to facilitate wetlands restoration (Section 16.1.6);
- AENV and ASRD include EC in their discussions with CNRL to determine acceptable monitoring and mitigation requirements for wildlife (Section 16.2.5);
- AENV and ASRD consider setting or developing performance measures for progressive reclamation (Section 16.4.5);
- AENV monitor EPL development and testing (Section 16.5.5);

- AENV limit long-term (quarter-year or annual average) sulphur dioxide (SO_2) emissions to levels that correspond with 99.2 per cent sulphur recovery at full calendar-day production rates (Section 17.5);
- AHW, in cooperation with HC, consider undertaking a regional health study primarily dealing with First Nations, Metis, and other aboriginal people (Section 18.6);
- AENV and ASRD provide stakeholders with an update on their expectations of RSDS, its deliverables, and the timing of those deliverables (Section 20.6);
- AENV and ASRD review and optimize their financial and human resourcing of CEMA to produce results in an earlier time frame (Section 20.6); and
- in addition to establishing an IFN for the Athabasca River in cooperation with DFO (Section 13.10), AENV develop and implement environmental management plans and objectives in the event that CEMA is unable to meet its timelines (Section 20.6).

2 INTRODUCTION

2.1 Application

CNRL filed Application No. 1273113 with the EUB, pursuant to Sections 10 and 11 of the Oil Sands Conservation Act (OSCA), for an oil sands mine, a bitumen extraction plant, and a bitumen upgrader and associated facilities in the Fort McMurray area. The project would also receive third-party oil sands material (mined ore or intermediate process streams, such as bitumen) for processing at its site and produce and ship oil sands material (mined ore or intermediate process streams, such as bitumen) from its site for processing at third-party facilities. In support of its proposal and as part of its application to the EUB, CNRL also submitted an environmental impact assessment (EIA) report to the Director of the Regulatory Assurance Division, Alberta Environment, pursuant to the Environmental Protection Enhancement Act (EPEA).

The proposed project is to be located approximately 70 kilometres (km) north of Fort McMurray in Townships 96 and 97, Ranges 11 to 13, West of the 4th Meridian. The project would be located on CNRL's leases, with sufficient resources to support mining activities for 42 years. Figure 1 shows the project location.

The project would be developed in three phases, as shown in Table 1.

Table 1. Development schedule and estimated capital costs

		Production rate (m^3/cd)		Capital expenditure
	Year	Upgraded oil	Bitumen	(billion $)
Phase I	2007	18 000	21 500	4.9
Phase II	2009	24 600	28 600	1.7
Phase III	2011	37 000	42 900	1.4
Total				8.0

The project includes the planning, construction, and operation of the following major oil sands facilities:

- shovel-truck mine to provide ore to support a bitumen production capacity of 42 900 cubic metres per calendar day (m^3/cd);
- relocatable ore preparation plants, using crushers and slurry hydrotransport;
- bitumen recovery plant, using primary separation cells and secondary and tertiary flotation;
- bitumen cleaning plant and associated environmental units;
- tailings pumping plant with coarse sand cyclones and fine tailings thickeners;
- tailings pond system for coarse sand tailings and thickened fine tailings impoundment, water inventory, and recycling;
- bitumen upgrader, using delayed coking and hydrotreating to produce an upgraded oil product and sulphur and coke by-products;
- on-site energy services infrastructure to generate electricity and steam, treat and recycle water, and provide potable water and sanitary sewage;
- road access and facilities to transport electric power, natural gas, and upgraded oil products;
- water requirements, including water intake facilities on the Athabasca River;
- storage facilities for diluted bitumen and intermediate and upgraded oil; and
- on-site infrastructure, including an air strip, offices, warehouses, security and loss prevention, health and safety, labs, fire hall, land fill, and hazardous waste storage.

The project also includes

- plans to manage, control, and mitigate environmental impacts during construction and operation of all facilities;
- a comprehensive mine drainage plan to intercept water that would flow onto the mine area from undisturbed areas (run-on water) and to collect run-off water in disturbed areas;
- management plans for all tailings produced by bitumen recovery and cleaning plants;
- management plans for all waste products produced by the project;
- a life-cycle water management plan;
- a closure plan and a ten-year conservation and reclamation (C&R) plan;
- initial and ongoing consultations with stakeholders on the social, economic, and environmental impacts of the project; and
- a number of bilateral agreements with stakeholders.

2.2 Canada/Alberta Joint Panel Review Process

CNRL also applied to DFO for approval under Section 35(2) of the Fisheries Act for the alteration, disruption, or destruction of fish habitat. Prior to DFO issuing an authorization, an environmental assessment of the project under CEAA was required.

On June 26, 2003, the Honourable Robert Thibeault, Minister of Fisheries and Oceans, referred the environmental assessment of the project to a review panel, pursuant to Section 21(b) of CEAA.

On July 30, 2003, the Canadian Environmental Assessment Agency announced that it was proposing to establish a joint environmental assessment panel for the project. Following a 21-day public comment period, The Honourable David Anderson, Minister of the Environment, and Neil McCrank, Q.C., Chairman of the EUB, signed an agreement to establish the Panel. The agreement is included as Appendix 2.

Under the agreement, the Panel is charged with fulfilling the review requirements under both CEAA and ERCA. Under ERCA, the Panel must determine whether the project is in the public interest. In making this determination, the Panel is required to consider a range of factors, including resource conservation, safety, economic and social impacts of the project, and effects on the environment.

Under its CEAA mandate, the Panel must assess the environmental effects of the project, including the environmental effects of malfunctions or accidents that could occur in connection with the project and any cumulative environmental effects that would likely result from the project in combination with other projects or activities that have been or would be carried out.

Under its CEAA mandate, the Panel must also determine the significance of the environmental effects of the project. In examining whether any potential adverse effects associated with the project were significant, the Panel considered their

- magnitude,
- geographic extent,
- duration and frequency,
- degree to which they are reversible or irreversible, and
- ecological context.

Under its CEAA mandate, the Panel must also consider whether there were technically and economically feasible measures that would mitigate any significant adverse environmental effects of the project.

This report sets out the Panel's decision and its reasons, rationale, conclusions, and recommendations with respect to its review of the project under ERCA and CEAA, and it includes a discussion of recommended mitigation measures and follow-up programs. The report also provides a summary of comments received from the public.

2.3 Hearing

The Panel consisted of J. D. Dilay, P.Eng. (Presiding Member), R. Houlihan, P.Eng., Ph.D., and G. Kupfer, Ph.D. The Panel considered the application at a public hearing held in Fort McMurray, Alberta, during September 15-19, 22-26, and 29, 2003. Accordingly, the Panel considers that the record was completed on October 16, 2003.

Those who appeared at the hearing and the abbreviations used in this report are set out in Appendix 3.

2.4 Submission of MEC

The Marlboro Environmental Committee (MEC) made a presentation at the hearing respecting the operations of certain facilities of Rio Alto Exploration Ltd. near Edson, Alberta, that were subsequently taken over by CNRL. MEC stated that it had no comments relating to the EIA or the project.

The Panel believes that MEC's issues are not related to the project and, therefore, the Panel does not deal with those issues further in this report. It has referred MEC's issues to AENV and the EUB's Field Surveillance staff to be dealt with as an operational matter.

3 ISSUES

The Panel considers the issues respecting the applications to be

- purpose, need, and alternatives to the project,
- adequacy of environmental impact assessment and need for follow-up,
- resource recovery,
- tailings management,
- environmental effects (water, terrestrial, and air),
- health effects,
- measures to enhance beneficial environmental effects,
- regional initiatives,
- social and economic effects,
- public consultation,
- capacity of renewable resources, and
- traditional use and cultural resources.

The following sections of the report summarize the evidence of CNRL and the interveners and provide the Panel's assessment of the issues. If CNRL or an intervener expressed no views on a particular issue, there is no corresponding section for that party provided in the report.

4 PURPOSE, NEED, AND ALTERNATIVES TO THE PROJECT

4.1 Views of CNRL

CNRL indicated that the purpose of the project was to produce oil at a competitive cost in an environmentally friendly manner and to provide wealth and an enhanced standard of living for the communities in which CNRL would be operating.

CNRL concluded that the orderly and economic development of its Athabasca oil sands resources through the project was a significant component of the company's growth strategy. It stated that the vastness of the resource, demonstrated extraction technology, and proven economics provided an attractive, long-term opportunity for sustained production. In addition to access to significant oil sands resources, CNRL indicated that it had the financial and human resources to undertake a project of this magnitude. CNRL stated that investment in the Athabasca oil sands was in the public interest. It believed that the project would offset declines in conventional oil production and help secure North America's energy resources for many years to come.

CNRL concluded that its schedule and implementation plan balanced many factors that would contribute to the success of the project. These factors included financing, market development, risk management, technology assembly, construction manpower, material availability, and operation staffing. To facilitate successful implementation, CNRL stated that it developed a phased approach that would lead to full production capacity over a period of nine years.

CNRL stated that it chose the project mine area for the following reasons:

- The area had a large, continuous ore body capable of supporting mine production at a level high enough to provide economies of scale.
- Its mining leases to the north and south could be developed as satellite mines without the need to replicate plant infrastructure.
- The area had adjoining in situ reserves for future development potential.

CNRL also used the following criteria to determine whether a particular oil sands mining, bitumen extraction, or bitumen upgrading technology would be considered:

- minimal environmental impact,
- contribution to an acceptable investment rate of return,
- confidence that technology would be commercially proven by 2003,
- compatible with the oil sands deposit, and
- reliable all-season performance.

CNRL determined that both dredging and hydraulic mining alternatives were highly inefficient in winter operations. CNRL was also concerned about bitumen recovery due to ore dilution from reduced mining selectivity. Therefore, CNRL did not evaluate these technologies further. It also eliminated underground and bucketwheel technologies from its consideration. It maintained that underground methods could not be proven by 2003 and considered bucketwheel systems to be too complex.

CNRL deemed dragline technologies unsuitable because the depth and thickness of ore zones at the project mine precluded adequate in-pit overburden casting. It was also concerned about slope stability.

CNRL considered shovel-truck technologies and rated them as comparable to other technologies but different in their merits. Conventional shovel-truck mining offered the best mine plan flexibility, least technical risk, and highest tailings adaptability, but rated lower on labour, energy intensity, and economics. CNRL indicated that technologies other than shovel-truck offered moderate technical risk with better energy use and lower labour intensity and that the potential for an autonomous shovel-truck system to reduce labour intensity was appealing. CNRL also indicated that continuous mining system combinations that were flexible and mobile and that preconditioned oil sands also had appeal.

CNRL selected shovel-truck with relocatable ore preparation plants as the mining method for the project.

With respect to Canadian oil reserves, including conventional, offshore, and heavy oil, CNRL stated that there were no direct alternative means of producing the project's oil except through oil sands mining and production. CNRL indicated that the bitumen ore would be most effectively and efficiently recovered through mining techniques. It stated that alternative bitumen recovery techniques, such as in situ methods, were far less efficient in recovery.

4.2 Views of the Panel

The Panel notes that no interveners argued against CNRL's stated need and purpose for carrying out the project. The Panel accepts CNRL's stated need and purpose and the criteria that CNRL used to evaluate the alternatives it identified. The Panel notes that the purpose and need for the project provide the context for the Panel's consideration of the alternatives to the project.

The project, as scoped by the signatories to the Panel agreement, is to construct and operate an oil sands surface mining, extraction, and upgrading facility. The Panel, having considered the alternatives to the project, concludes that sufficient information about the alternatives and CNRL's analysis of those alternatives has been provided and that the information supports CNRL's selection of the project.

5 ADEQUACY OF ENVIRONMENTAL IMPACT ASSESSMENT AND NEED FOR FOLLOW-UP

This section deals with intervener assertions that the assessment of the environmental impacts of the project was incomplete. Notwithstanding that other sections in this report deal with the specific concerns of interveners, this section summarizes the overall views.

5.1 Views of CNRL

CNRL stated that the EIA was prepared in accordance with the requirements prescribed under EPEA, OSCA, and any federal legislation that applied to the project. It completed the EIA in accordance with the terms of reference issued by AENV following requests for input from federal and provincial regulators, stakeholder groups, regional communities, and CNRL. Under the terms of reference, the EIA would

- identify the environmental resources potentially affected by the project;
- predict positive and negative impacts and the extent to which negative impacts could be mitigated;
- quantify and assess impact significance where possible;
- identify information sources;
- explain the selection of key components to be examined in the EIA and the influence of the consultative process in the selection; and

- describe the following for each environmental parameter:
  - existing baseline conditions,
  - the nature and significance of effects and impacts of the proposed project,
  - how biodiversity is addressed,
  - plans to eliminate, minimize, or mitigate negative effects and impacts,
  - residual impacts and their significance,
  - a plan to monitor effects and impacts and to demonstrate acceptable environmental performance, and
  - a plan to address those adverse impacts that require cooperative resolution by government, industry, and the community.

The EIA was also required to address the cumulative effects that were likely to result from the project in combination with other existing, approved, and planned projects or foreseeable activities in the region.

CNRL used two major study areas to assess the potential impacts of the project, the regional study area (RSA) and the local study area (LSA). CNRL indicated that the RSA was used to evaluate the impacts of the project in terms of the larger geographic and ecological contexts. CNRL used the LSA to evaluate areas directly impacted by the project. CNRL indicated that the spatial extent of the study areas varied for different EIA components.

CNRL stated that it based the temporal considerations for the EIA on the project description and included unique conditions that affected environmental components differently. For most project components, CNRL's impact analyses considered construction and operations together. Some of CNRL's EIA components, particularly the terrestrial components, examined the project under three temporal conditions: predevelopment, full development, and closure. For the terrestrial assessments, it defined closure as 80 years following reclamation.

CNRL noted that, although not explicitly included in the criteria, there would always be some uncertainty associated with the information, methods, and conclusions used in an EIA because of its predictive nature.

CNRL noted that AENV had confirmed in writing that its EIA was complete pursuant to Section 53 of EPEA.

5.2 Views of MCFN

With respect to the sections of the EIA that it had reviewed, the Mikisew Cree First Nation (MCFN) identified a number of gaps and uncertainties dealing with aquatic and terrestrial resources. In the area of water resources, these gaps related to baseline data quality, monitoring programs, modelling analysis, cumulative effects analysis, climate change, hydrogeology monitoring, and water quality analysis. In the area of terrestrial resources, these gaps related to cumulative footprints, monitoring, traditional knowledge, and vegetation sampling. MCFN requested that CNRL's approval be delayed or denied until the gaps in the EIA had been filled and the predictions, proposed mitigation, monitoring, and reclamation plans from a revised EIA had been reviewed and approved by the stakeholders, particularly MCFN and the EUB. Notwithstanding these gaps, MCFN outlined a number of recommendations dealing with social and environmental issues that it wanted implemented in the event that the project was approved. These recommendations are outlined in other sections of this report.

5.3 Views of Alberta

AENV stated that the EIA was complete, pursuant to Section 53 of EPEA. AENV stated that it did not expect an EIA to remove all uncertainties about a project. It noted that the provincial team's review of the EIA pointed to the need for additional data collection in some areas, environmental monitoring to assess the validity of predictions and identify potential impacts, and potential management programs. AENV stated that should the Panel recommend for approval CNRL's application and in the event that the project was approved under EPEA and the Water Act, there would be opportunity to require the collection of additional data before the project was constructed.

AENV stated that the inclusion of certain terms and conditions in its EPEA approval relating to data collection, monitoring, emission management programs, and additional validation of existing modelling of impacts could address the uncertainties and many of the concerns raised throughout the hearing process.

In its closing remarks, AENV stated that having regard for all of the information collected through its involvement in this project and its attendance at the hearing, it had no objection in principle to the proposed project provided that the Panel found the project to be in the public interest having regard to the social, economic, and environmental impacts; that the matters raised by Alberta were properly addressed; and that CNRL complied with all regulatory requirements of the Alberta departments.

5.4 Views of the Panel

Under CEAA, the Panel has a responsibility to conduct an assessment of the environmental effects of the project. In conducting this assessment, the Panel must ensure that all information required for its assessment is obtained and made available to the public. The Panel considered the spatial and temporal boundaries that CNRL used in its EIA and concludes that the boundaries are reasonable and reflect the ecological context of the project. The Panel has reviewed the EIA and the information brought forward during the hearing and concludes that it has the necessary information to conduct its assessment of the environmental effects of the project.

The Panel has also considered the need for and requirements of follow-up in the environmental assessment of the project. This need is discussed throughout this report in the appropriate sections. The specific areas of follow-up identified by the Panel include

- basal aquifer depressurization,
- tailings management,
- effects on fish and fish habitat,
- effects on water quality and quantity,
- effects on wildlife, and
- reclamation.

The Panel is of the view that the specific recommendations in this report should allow CNRL to further develop the follow-up programs early in the planning stages of the project, discuss them with the appropriate regulatory authorities and other stakeholders, and ensure their implementation. The Panel recommends that CNRL consult and work with appropriate stakeholders with specific expertise in the development of the follow-up programs.

Specific recommendations in this report related to follow-up programs provide a mechanism to ensure that the programs are sufficiently detailed and scientifically rigorous.

CNRL's follow-up programs should

- contain sufficient baseline information,
- be quantitative in nature and have statistical power,
- include a description of the mitigation to be implemented,
- include detailed descriptions of the monitoring methods, timing, and duration of the study,
- contain reporting and success measurement criteria,
- be developed in consultation with stakeholders having specific expertise or interests,
- ensure that consultation with the regulatory authorities has been carried out, and
- ensure that results are communicated to stakeholders.

6 ALTERNATIVE MEANS OF CARRYING OUT THE PROJECT

6.1 Views of CNRL

During the planning stages of the project, CNRL considered several alternative means of recovering the bitumen resource. In selecting the technology for the project, CNRL evaluated the cost, reliability, operability, maintainability, economic and energy conservation performance, and commercial readiness of components for each segment of the project.

With respect to surface mining alternatives, CNRL evaluated mine plans using several criteria, including environmental impacts, transportation logistics, and mine economics. In considering facility location alternatives, CNRL investigated several alternative locations for the plant site and external tailings pond. The location for the plant site was based on economics, resource conservation, environmental impacts, geotechnical conditions, and future expansion potential.

CNRL undertook a comprehensive selection process to identify appropriate bitumen extraction technologies. It stated that the process had to deliver equal or higher bitumen recovery for equivalent feed than existing oil sands facilities did and had to meet EUB guidelines.

CNRL examined many criteria to select the bitumen upgrading technology and concluded that the best option was to produce a fully upgraded product that was low in sulphur and would compete favourably with sweet conventional crude oils in its chosen market. From 83 initial alternatives for primary upgrading, including delayed coking, fluid coking, flexicoking, ebullated bed and slurry hydrocracking, and solvent deasphalting, CNRL chose delayed coking. It selected conventional hydrotreating for secondary upgrading and the Shell Claus Off-gas Treating

(SCOT) technology for sulphur recovery, based on minimization of emissions, overall reliability and cost, and compliance with the *Interim Directive (ID) 2001-3: Sulphur Recovery Guidelines for the Province of Alberta* of 98.8 per cent sulphur recovery.

CNRL investigated possible sources of raw water, including the Athabasca, Tar, and Calumet Rivers, groundwater, peatland drainage, and overburden dewatering.

The main criteria for selecting the water supply included reliable availability of water, sufficient water volume, acceptable water quality, minimal environmental impacts, and mitigation possibilities. CNRL stated that the Athabasca River was the only reliable source of sufficient quantities of raw water, and its proximity to the plant site made the river the most economical and reliable source for the project with the least impact on the environment. For these reasons, CNRL selected the Athabasca River as the primary source for the raw water supply.

For the water intake site, CNRL conducted an assessment of five alternative locations along the west bank of the Athabasca River. The main criteria CNRL used to select the intake site were availability of adequate water supply, channel section configuration and stability, long-term health and safety factors, proximity to the proposed plant site, regulatory requirements, and environmental impacts.

Following initial screening using historical air photos, CNRL conducted bathymetric and fish habitat surveys on three sites. It concluded that the mouth of the Tar River and Sutherland Island was the preferred site.

CNRL also evaluated seven conceptual river intake designs for this location on the river, with the main criteria for selecting the intake design being regulatory criteria and acceptability, engineering and technical performance, capital, operational, and maintenance costs, and environmental impacts. CNRL concluded that the bank intake noted above was the preferred river intake system.

CNRL considered eight alternative diversion plans for the Tar and Calumet Rivers. It assessed each alternative based on environmental, technical, and economic criteria, including minimizing losses of aquatic and terrestrial habitats, minimizing conflict with project processes, maximizing ease of operations, avoiding bitumen resource sterilization, and minimizing capital, operational, compensation, and closure expenditures. CNRL ranked impoundment of the Tar River the highest overall. CNRL stated that this alternative would provide fish habitat compensation at a lake, provide process water to the project, and divert upstream flows from the mining area so as to minimize ore sterilization.

6.2 Views of the Panel

The Panel concludes that CNRL has provided adequate information on alternative technologies and construction methods that are technically and economically feasible for the Panel to consider these alternative means and their environmental effects. The Panel accepts the shovel-truck mining, water-based bitumen extraction, and bitumen upgrading by delayed coking as the preferred alternative means of carrying out the project. The Panel accepts the need to divert portions of Tar and Calumet Rivers to access the reserves. The Panel believes that the CNRL mine plan and the location of the plant and waste disposal are necessary for resource recovery and consistent with good engineering and environmental management practices. The Panel also accepts that water is needed for the project and that the most suitable source is the Athabasca River.

7 MINE PLANNING AND RESOURCE RECOVERY

7.1 Lease Boundary Mining

7.1.1 Views of CNRL

CNRL indicated that the southeastern portion of the project's ore body extended onto the adjacent Deer Creek Energy Limited (DCEL) lease. CNRL stated that it had had discussions with DCEL over the past two years to develop plans for recovering resources along the southeast common lease boundary, but no formal agreement had been reached. CNRL further stated that it believed an agreement could be reached if project development were to proceed, and it committed to continuing discussions with DCEL.

CNRL stated that it had proposed to leave a pillar of oil sands of some 9.9 million cubic metres (10^6 m^3) of recoverable bitumen along the southeastern portion of the common lease boundary. This design would provide an additional 177 10^6 m^3 of in-pit tailings storage space and allow in-pit tailings operations to begin up to one year earlier, when compared to the base case of constructing a dike on CNRL's side of the lease boundary.

CNRL stated that it would complete additional work in the lease boundary area to finalize a mine development plan prior to overburden removal. CNRL did not see the need for the Panel to place time constraints upon the completion of this work.

7.1.2 Views of DCEL

DCEL stated that it intended to complete additional drilling, geological modelling, and an economic mine development analysis within the potentially mineable oil sands area adjacent to the southeast portion of the CNRL lease boundary in early 2004. The results of this information would form the basis of a preliminary mining feasibility study. DCEL stated that it would share this information with CNRL to help the parties arrive at a mutually agreeable development plan that maximized recovery of resources along the southeast portion of the CNRL lease boundary.

7.1.3 Views of the Panel

The Panel notes that CNRL is committed to continuing discussions with DCEL to develop plans for recovering resources along the southeast portion of the CNRL lease boundary. It also notes that plans must be in place well in advance of mining at the lease boundary to allow for tree clearing, placement of ditches and dewatering of muskeg, location or relocation of infrastructure, and incorporation of material volumes into workable mine and tailings management plans. The Panel finds that requiring CNRL to submit mining details and alternatives at least five years prior to commencement of mining at the lease boundary is a prudent course of action. This would allow time to gather additional information if any is required and to evaluate the mining alternatives identified. The five-year submission requirement is further justified in the event that leaseholders cannot reach agreement and EUB intervention is required.

CNRL has indicated that there are two areas where the mineable resources are shown to cross the common lease boundary, a southwest area and a larger southeast area. Given that mine start-up is scheduled during 2005 and southwest mining is scheduled for 2011, the Panel believes that it would be impractical to require CNRL to submit information on mining details and alternatives five years prior to mine development reaching the southwest area.

The Panel therefore directs that on or before December 31, 2007, CNRL shall submit for EUB approval a southwest area lease boundary report containing a comprehensive evaluation of the lease boundary geology and reserves, geotechnical conditions, alternative mining scenarios and impacts, and associated costs, in accordance with Section 3.1 of EUB *ID 2001-7: Operating Criteria—Resource Recovery Requirements for Oil Sands Mine and Processing Plant Sites.*

The Panel also directs that at least five years prior to mining at the southeast lease boundary, but no later than December 31, 2010, CNRL shall submit for EUB approval a southeast area lease boundary report containing a comprehensive evaluation of the lease boundary geology and reserves, geotechnical conditions, alternative mining scenarios and impacts, and associated costs, in accordance with Section 3.1 of *ID 2001-7.*

7.2 Plant Site Location

7.2.1 Views of CNRL

CNRL indicated that it had conducted an evaluation of potential plant sites and that it had originally selected a plant site adjacent to the south boundary of the lease. CNRL stated that this plant site was underlain by some 42.5 10^6 m^3 of recoverable bitumen.

CNRL also indicated that the originally proposed plant site location was underlain by thick sequences of geotechnically weak Clearwater clay. CNRL stated that it performed additional geotechnical analyses to determine the feasibility of constructing a major bitumen upgrading facility at this location. The results indicated that the construction of such a facility upon this type of foundation was without precedent. CNRL also stated that it considered pile foundation costs to be prohibitive due to the volume of concrete required. CNRL further stated that pile foundation movements would pose a serious risk to the operation of heavy upgrading components, such as the cokers.

As a result of the concerns regarding foundation conditions, CNRL relocated its proposed plant site northward to the location shown on Figure 1. CNRL believed that the new plant site location would address the geotechnical concerns associated with the originally proposed site, since Clearwater clays were absent in portions of the new location. It recognized that construction of the plant in the new location would result in the sterilization of approximately 53.9 10^6 m^3 of recoverable bitumen, 11.4 10^6 m^3 more than the original site. However, CNRL indicated that its analysis showed that the additional costs associated with the original plant site exceeded the value of the additional foregone bitumen resources associated with the new plant site.

CNRL also stated that there were the following significant cost and environmental benefits associated with the new mine plan that resulted from the new plant site location:

- a reduction in the seepage through the Pond 1 tailings dike, resulting from the change from tailings sand to overburden material,

- a reduction in the Pond 1 dike cost and mobile fleet emissions, resulting from the shorter haul distances associated with the Pond 1 dike location, and
- a reduced mine footprint and accelerated in-pit tailings disposal schedule.

CNRL stated that the area required for the new plant site would include all of the facilities associated with the three phases of the project. It also stated that an additional area surrounding the new plant site had been set aside to protect various upgrading components from the effects of foundation movement caused by mining.

7.2.2 Views of the Panel

The Panel considers the volume of recoverable bitumen present beneath each plant site location to be significant. However, it believes that no alternative plant site location is available that would meet CNRL's criteria for locating its plant while avoiding resource sterilization altogether. The Panel therefore accepts that some resource sterilization is necessary for the construction of the project plant site. The Panel also accepts that the costs and risks associated with the original plant site location are important considerations in the evaluation of the plant site.

The Panel therefore finds that CNRL has justified the additional resource sterilization beneath the new plant site. Notwithstanding the overall acceptance of the proposed plant site, the Panel believes that since the layout of the plant site facilities remains to be finalized, some reduction in size may be realized through optimization of facilities. It therefore directs that six months prior to the construction of the plant site, CNRL shall submit a report to satisfy the EUB that all reasonable efforts have been made to optimize the plant site area with respect to the minimization of resource sterilization. The Panel notes that any additional oil sand sterilization resulting from an increase to the plant site area would require prior EUB approval.

7.3 Discard Site Design and Overburden Disposal Areas

7.3.1 Views of CNRL

CNRL stated that a number of overburden discard sites would be required for the permanent storage of mine waste materials over the life of the project. These include several out-of-pit discard site locations in addition to those located in the mined-out pit.

7.3.2 Views of the Panel

The Panel finds that the discard site locations are reasonable, based on the currently available drilling information. The Panel also understands that further drilling will be completed within these discard site locations prior to the geotechnical designs being finalized. The Panel directs CNRL to submit for EUB approval detailed geotechnical designs for all external overburden disposal areas at least six months prior to field preparation in these areas.

7.4 Operating Criteria

7.4.1 Views of CNRL

CNRL stated that it would comply with the operating criteria set out in *ID 2001-7* but that it expected that situations might arise during operations requiring a relaxation of the criteria. CNRL stated that it would apply to the EUB at the appropriate time for approval of such a relaxation, complete with justification to support its application. CNRL also stated that a relaxation of operating criteria might be required during start-up operations.

7.4.2 Views of the Panel

The Panel accepts CNRL's commitment to meet the overall bitumen recovery requirements in *ID 2001-7*. The Panel believes these criteria to be a minimum acceptable level of performance and expects operators to design their plant facilities and mining operations to meet them.

The Panel notes that the operating criteria performance measuring process is an after-the-fact process in that the quantity of bitumen that should have been recovered during a given year is estimated after the year is completed. Enforcement action, if required, would take place after mining has been completed. As outlined in *ID 2001-7*, a report issued at the end of the year outlining deviations from the EUB directive would not preclude the EUB from taking enforcement action.

Notwithstanding the above, the Panel also understands that operating a new oil sands project can be challenging, especially during the initial four-to-six-month period. Therefore, if after completing detailed engineering designs, CNRL believes that it will be unable to meet the requirements specified in *ID 2001-7* during commissioning, the Panel expects that CNRL will submit a detailed plan specifying the expected increased bitumen losses and provide a technical and economic justification to the EUB for approval. The plan must be submitted at least three months prior to the processing of oil sands in the extraction plant.

7.5 Pit Wall Stability Adjacent to the Athabasca River

7.5.1 Views of CNRL

CNRL stated that it had completed preliminary geotechnical and geological work to establish pit limits for the east side of the south pit adjacent to the Athabasca River. CNRL also stated that it planned to complete additional geotechnical, geological, and mine evaluation work prior to undertaking any major disturbance in this area and that it could submit this information with the annual mine plan.

7.5.2 Views of the Panel

The Panel notes that the EUB is responsible for ensuring the stability of overburden dumps and mine pit walls. The Panel also notes that because CNRL has not specifically identified the ore quality and quantity adjacent to the Athabasca River, the value of this resource is uncertain at this time. The Panel recognizes CNRL's plans to conduct further evaluations and mine design work in this area. It directs CNRL to submit a report to the EUB for approval at least five years prior to mining at the final pit wall, but no later than December 31, 2016. This report must contain an evaluation of the mineable oil sands ore quality and nonrecoverable quantity in the east final pit wall area adjacent to the Athabasca River and a detailed geotechnical stability evaluation of the final east pit wall location.

7.6 Shovel-Mobile Ore Preparation Plant

7.6.1 Views of CNRL

CNRL proposed to commence use of the Shovel-Mobile Ore Preparation Plant (MOPP) technology during Phase 2 of the project. The MOPP system incorporates a conventional mining shovel supplying oil sands to a mobile crusher and a slurry preparation plant. CNRL stated that a major component of the MOPP technology was being operated successfully in Australia and South Africa. CNRL reported that it planned to test this technology during the winter of 2003/2004 and to have a commercial unit fully operational by 2009.

7.6.2 Views of the Panel

The Panel is encouraged to see testing of the type of equipment proposed for use by CNRL, and it recognizes the benefits that could be realized if the technology is successful. The Panel approves the use of this new technology, provided that it meets operating criteria. The Panel directs CNRL to submit the details of the MOPP testing to the EUB as part of each annual mine plan submission, beginning with the September 2004 submission and ending one year after MOPP has achieved one month of its nominal production capacity.

7.7 Basal Aquifer Depressurization

7.7.1 Views of CNRL

CNRL stated that its basal aquifer depressurization activities could result in depressurization of laterally continuous basal aquifers on DCEL's lease. CNRL stated that, as a result, there was a potential that pressure changes in the basal water sands could transfer vertically through the overlying bitumen and affect the pressure in any overlying steam-assisted gravity drainage (SAGD) steam chamber. CNRL noted that at this time only a relatively small portion of DCEL's Joslyn Creek project appeared to be over basal water. CNRL stated that the current drilling information indicated that there could be a localized hydraulic connection in the basal aquifer at its lease boundary with DCEL. However, CNRL did not believe that the data supported a hydraulic connection to DCEL's Joslyn Creek development area farther south of the lease boundary.

However, CNRL also stated that where SAGD operations did not overlie laterally continuous basal water sands, the potential for DCEL's project to be impacted by mine depressurization activities would be very low. CNRL argued that the diffusivity of the oil sands was so low that pressure transfer in the bitumen phase would be near zero. CNRL stated that the low permeability of oil sands was demonstrated during a 1996 pumping test at Syncrude Canada's Aurora mine and that this test was the basis for the hydraulic conductivity value CNRL used in its application. Furthermore, CNRL relied on a 1993 Alberta Research Council study to conclude that within the McMurray/Wabiskaw system, discontinuous sand and shale lenses and large areas of bitumen-saturated sands could act locally as flow barriers and, therefore, justify the use of lower hydraulic conductivity data.

CNRL acknowledged that there was a need for it and DCEL to gather additional information to better understand the impacts of depressurization on DCEL's lease. As a result, CNRL agreed to

- work with DCEL to develop a joint monitoring program at its lease boundary with DCEL, in order to establish baseline pressure conditions in the basal water sands,
- undertake continuous monitoring to detect any changes in baseline conditions as a result of CNRL's mine depressurization activities and to share this information with DCEL,
- file annually with the EUB the findings and programs associated with the monitoring, and
- prior to the start-up of formal dewatering activities, and if there were reason to do so, submit to the EUB and DCEL a report describing the steps, if any, that CNRL would undertake to prevent any adverse effects on DCEL's ability to recover its oil sands resources arising from depressurization activities by CNRL.

7.7.2 Views of DCEL

DCEL stated that it believed the mine depressurization activities of CNRL would have a detrimental effect on its proposed Joslyn Creek SAGD project. DCEL pointed out that its Joslyn lease was directly south and adjacent to CNRL's proposed project. DCEL stated that it did not believe other mining operations to the east and south of its lease would likely have any impact on its SAGD operations.

DCEL stated that CNRL's mine depressurization activities would result in a drawdown of water levels in the basal aquifer extending outward beyond CNRL's lease and into its Joslyn lease. DCEL claimed that this would result in a loss of hydraulic head to the basal water sands underlying its lease, and that this would lead to a pressure loss in the overlying bitumen zones. DCEL stated that reducing the reservoir pressure in the bitumen zones would render bitumen recovery through the use of SAGD uneconomic, resulting in the sterilization of significant bitumen resources.

DCEL acknowledged that the basal water sands were currently mapped as discontinuous, although it noted that drillhole information was continuing to be gathered. Nonetheless, DCEL concluded that the data presented by CNRL predicted a widespread, regional drawdown effect, despite the apparent discontinuous nature of the basal aquifer, and that this effect would occur regardless of the presence or absence of basal water sand.

DCEL argued that pressure changes in the basal water sands would move out into the bitumen zones (called cross-formational flow) and reduce the pressures in these zones. In support of its contention, DCEL stated that CNRL's information implied a hydraulic connectivity between the basal aquifer, Quaternary sediments, and surface water bodies, which indicated a strong downward hydraulic gradient from the water table across the bitumen zones into the basal water sands.

DCEL noted studies on basal water sands on the Albian lease east of DCEL/CNRL. Based on the measurement of tritium concentrations in the basal water, the studies indicated a higher hydraulic conductivity on a regional basis than used by CNRL in its analysis. This pointed to a significant concern for cross-formational flow of groundwater. DCEL also cited an Alberta Research Council publication that it argued implied that cross-formational flow existed in the McMurray and Wabiskaw aquifers.

DCEL stated that its situation was analogous to recent bitumen conservation issues in which pressure transmission through the bitumen zones was argued to occur due to overlying gas production. In this regard, DCEL cited EUB *Decisions 2000-22*[1] and *2003-23*[2] as support for the pressure transmission mechanism and the impact of pressure reductions on SAGD recovery and cited *General Bulletin (GB) 2003-12,*[3] *GB 2003-16,*[4] and *GB 2003-28*[5] as explaining the EUB's views on this issue.

DCEL requested that

- a monitoring program be implemented by CNRL at the DCEL/CNRL lease boundary to establish baseline pressure regimes in the basal aquifer and McMurray oil sands zones and to monitor changes in the baseline pressure regimes;
- both itself and CNRL share all monitoring data;
- CNRL acknowledge that it had an obligation to satisfy the EUB that its activities would not adversely affect the subsurface pressure regimes on the DCEL lease; and
- CNRL acknowledge that it had an obligation to prevent any adverse effects on the subsurface pressure regime on the DCEL lease caused by CNRL's activities.

7.7.3 Views of the Panel

The Panel notes that CNRL and DCEL agree that there is evidence to suggest that CNRL's basal aquifer depressurization activities could result in depressurization of laterally continuous basal water sands on DCEL's lease. As a result, there is a potential that pressure changes in the basal aquifer could transfer vertically through the overlying bitumen and affect the pressure in any overlying SAGD steam chamber. The Panel also notes that CNRL and DCEL disagree on whether or not SAGD operations that do not directly overlie basal water sands would be similarly impacted.

The Panel further notes that while hydraulic connectivity of the basal aquifer appears likely at the lease boundary between CNRL and DCEL, it is uncertain whether that connectivity exists in the region of DCEL's proposed SAGD project and, in the absence of connectivity, whether pressure changes through the bitumen zones would occur.

The Panel believes that careful monitoring of the impacts of CNRL's depressurization activities is important, given the implications for resource recovery on in situ bitumen deposits in the region and the possible need to undertake mitigation measures to ensure resource conservation and the protection of DCEL's correlative rights. The Panel expects that CNRL will ensure that timely mitigation steps are taken in the event that abnormal operating events are identified.

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[1] *Decision 2000-22: Gulf Canada Resources Limited Request for the Shut-in of Associated Gas, Surmount Area*

[2] *Decision 2003-23: Chard Area and Leismer Field, Athabasca Oil Sands Area*

[3] *GB 2003-12: Gas Production in Oil Sands Areas*

[4] *GB 2003-16: Proposed Conservation Policy Affecting Gas Production in Athabasca Wabiskaw-McMurray Oil Sands Areas*

[5] *GB 2003-28: Bitumen Conservation Requirements Athabasca Wabiskaw-McMurray*

The Panel directs CNRL to

- provide the EUB, for its review and approval, with a monitoring plan to detect basal aquifer pressure changes at its lease boundary with DCEL six months prior to beginning its mine depressurization activities;
- provide a report to the EUB on or before February 28 of each year following start-up of mine depressurization activities, or on such other date as the EUB may stipulate, on the results of its lease boundary monitoring program; and
- satisfy the EUB within one year of project approval on the need, or otherwise, to monitor the effects of its depressurization and injection activities along the northern and western boundary of its mining activities.

The Panel also expects CNRL to honour its commitment to work with DCEL in developing an appropriate monitoring program, to share the results with DCEL, and to take corrective action where necessary.

8 BITUMEN PRODUCTION AND ASSOCIATED FACILITIES

8.1 Bitumen Recovery

8.1.1 Views of CNRL

CNRL selected a warm water extraction process for froth bitumen production. It stated that the process would incorporate primary separation cells, secondary and tertiary flotation, cycloning coarse sand tailings, and fine tailings thickening. CNRL had designed its extraction process to provide flexibility of operation and to optimize extraction and energy efficiencies while minimizing tailings production.

CNRL claimed that its extraction process would yield equal or higher bitumen recovery for equivalent oil sands feed than that recovered at existing oil sands processing facilities and that it would meet the guidelines of *ID 2001-7*. CNRL committed to 89.9 mass per cent extraction bitumen recovery at an average oil sands grade of 10.65 mass per cent.

CNRL selected a naphtha solvent-based process to produce bitumen from froth. It noted that further evaluations of inclined plate separators, centrifuges, cyclones, and other alternative processing equipment were ongoing.

CNRL stated that it had removed from its design the naphtha recovery unit (NRU) tailings thickener to recover heat energy in the tailings due to safety issues of residual solvent in the recovered water and to high capital and operating costs.

8.1.2 Views of the Panel

The Panel encourages oil sands developers to use new and modified technology that will maximize resource recovery, reduce energy and water consumption, and minimize fluid tailings production. The Panel believes that CNRL is attempting to meet these goals by its selection of a flexible extraction process and the use of thickeners. The Panel believes that the modified process will obtain acceptable bitumen recoveries and will enable CNRL to meet operating criteria.

8.2 Naphtha Recovery

8.2.1 Views of CNRL

CNRL stated that it would use hydrotreated diluent naphtha in its froth treatment plant and that the diluent naphtha would be recovered from tailings in the NRU prior to discharge to the tailings pond. CNRL committed to limit its annual average diluent losses to tailings to 4.3 volumes per 1000 volumes of bitumen produced, including vents, tankage, and other fugitive volatile organic compound (VOC) emissions. As a result, CNRL noted that the fugitive emissions, primarily VOCs, would be minimized from its tailings pond. CNRL committed not to send untreated froth treatment tailings to the tailings area during normal operations.

CNRL believed that its diluent losses in NRU tailings could be achieved with the use of two NRUs, each receiving 50 per cent of froth treatment plant tailings. CNRL stated that its NRUs were designed so that each could hydraulically handle all of the froth treatment tailings flow. With increased steam to the NRU and expected short, infrequent durations of one NRU operation, CNRL stated that it would still meet its diluent loss commitment on an annual average basis. CNRL's modelling showed that the number of occurrences of 100 per cent flow to one NRU would be so infrequent that CNRL would be able to meet its commitment.

8.2.2 Views of Alberta

AENV noted that VOCs could be a concern from the perspective of odours, human health, and environmental effects and could act as a catalyst in ground-level ozone formation. AENV stated that it expected the plant to be designed and operated in a manner that minimized the frequency of any odour incidents. AENV stated that it might include conditions in any EPEA approval that would require CNRL to provide 100 per cent NRU redundancy or to reduce throughput when necessary to ensure that no untreated tailings were sent to the tailings pond so that VOC emissions were minimized during all operating conditions.

8.2.3 Views of the Panel

The Panel notes CNRL's commitment that its site-wide, annual average diluent losses will not exceed 4.3 volumes per 1000 volumes of bitumen production, inclusive of normal, start-up, and upset conditions. The Panel also notes CNRL's commitment not to discharge untreated froth treatment tailings to the tailings area during normal operations.

The Panel notes AENV's concern about VOCs and the need for the plant to be designed and operated to minimize odour incidents. The Panel believes that the same approach to minimize odour incidents should be applied for all oil sands operations. The Panel notes that recent EUB approvals have set the limit on diluent losses at 4.0 volumes per 1000 volumes of bitumen production.

Therefore, the Panel directs that, on an annual average basis, CNRL limit site-wide diluent losses to 4.0 volumes per 1000 volumes of bitumen production, unless it can satisfy the Board that a limit of 4.3 is appropriate. The Panel recognizes that the lower limit may require CNRL to add additional equipment or modify its operating practices. The Panel also directs CNRL not to discharge untreated froth treatment tailings to the tailings area.

The Panel concludes that the diluent losses would not result in significant adverse environmental effects.

9 UPGRADING

9.1 Bitumen Conversion

9.1.1 Views of CNRL

CNRL stated that its selected upgrader process would use vacuum towers, delayed coking, and hydrotreating of distillate to produce an upgraded oil product and sulphur and coke by-products. It noted that it would improve the marketability of its upgraded product by increasing gas-oil hydrotreating severity. CNRL estimated an upgraded product yield of 86.3 volume per cent, including butanes.

CNRL stated that it would optimize energy efficiency through cogeneration for steam and electric power. It stated that it rejected coke to fuel cogeneration because of high capital, operating, and maintenance costs and increased air emissions. It considered gasifying coke to reduce or eliminate import of natural gas but rejected that on the basis of unfavourable economics. Imported natural gas would fuel gas turbine generators and plant fuel gas would be used for heaters, heat recovery steam generators, duct burners, and steam boilers. CNRL stated that the cost of natural gas had a relatively low impact on the overall sustainability of the project.

9.1.2 Views of WBFN

Wood Buffalo First Nation (WBFN) stated that CNRL was not proposing to use the most modern technology for its bitumen upgrading. WBFN believed that CNRL's technology seemed to leave a lot of toxic waste behind. In particular, WBFN was concerned that coke was stored and not used as fuel in the process. WBFN claimed that a more advanced upgrading process was available that produced less coke and consumed less water, but it provided no evidence. WBFN recommended that the Panel ensure that CNRL was using the most modern technology.

9.1.3 Views of the Panel

The Panel is satisfied that CNRL has assessed alternative technologies adequately and accepts the selected upgrading technology as discussed in Section 6. The Panel notes that delayed coking produces large quantities of coke, which CNRL does not consider an appropriate fuel source and for which there currently is no off-site market. The Panel accepts storage of coke but notes that it considers coke to be an energy resource with potential to replace natural gas as an alternative fuel and feedstock for hydrogen generation. It expects CNRL to continue to examine the economic and technical feasibility of using its coke production. The Panel directs CNRL to submit a report to the EUB on the feasibility of coke use and sales potential every five years commencing February 28, 2010, or such other date as the EUB may stipulate.

9.2 By-product Storage

9.2.1 Views of CNRL

CNRL stated that it would store its coke and sulphur production in a manner that was environmentally safe and so that it was accessible for recovery at a later date until a viable market was available. It would store 3.1 10^6 tonnes per year of coke and 549 thousand (10^3) tonnes per year of sulphur.

CNRL stated that it would stockpile the sulphur in solid blocks. The initial blocking facility would consist of a pad, runoff pond, and enclosing berm with a polyvinyl chloride liner. It would have a base of approximately 80 hectares (ha) and would reach a height of about 20 m in 20 years. It would neutralize runoff water collected in the runoff pond and discharge it into the recycle pond. CNRL noted that it would degas the liquid sulphur. It believed that once the sulphur was blocked, there would be no problems with sulphur dusting, vapour emissions, or odour off site. If sulphur storage were required beyond 20 years, CNRL would construct new storage facilities in the mined-out area.

CNRL stated that it proposed to develop the coke storage location northwest of the sulphur block as an integral part of Waste Area 3. The location had the advantages of

- shorter haul distances,
- containment within overburden waste, and
- accessibility for recovery should a market develop.

CNRL noted that the sulphur block would be about 100 m from the coke storage area and stated that it believed that the mitigative measure of removing all combustible materials between the two areas eliminated any chance of fires at the sulphur block. It stated that with the 100 m separation and the lining of the sulphur area, it believed that any concerns about leaching of heavy metals and contamination and cross-contamination were adequately addressed.

CNRL stated that it had designed a management system at the coke pile to prevent fires from spontaneous combustion caused by large clinker coke. The management system included track packing with large dozers in very thin lifts to eliminate or reduce clinker coke. In some rare instances, the clinker coke would be removed, laid in thin lifts, and capped with waste material. CNRL stated that its estimate of particulates from the project did not include emissions from fires at the coke pile, because it would put in place mitigative measures to prevent fires. CNRL stated that it had a dust suppression system to prevent dusting from the coke pile and that it would periodically reclaim the pile with grass to assist with dust control.

9.2.2 Views of WBFN

WBFN expressed concern that particulate matter had the potential to adversely affect human health and that the particulates from coke pile fires had not been included in CNRL's estimate of particulate emissions from its project.

WBFN expressed concern about the potential for sulphur block fires resulting from sparks from coke pile fires, because the sulphur block would be close to and downwind of the coke pile.

WBFN expressed concern that the fugitive emissions assessment for the plant site did not include emissions from the sulphur blocking operation and that the emissions had not been included in the potential acid input (PAI) estimates.

9.2.3 Views of Alberta

AENV stated that runoff from aboveground sulphur block storage could be managed to prevent impacts on groundwater and surface water by capturing and neutralizing any runoff water. AENV stated that runoff or groundwater from coke storage was not of particular concern because of the limited solubility of coke. AENV stated that concerns about coke related to particulate matter being wind-blown off of the coke storage pile and management of coke to prevent fires. It stated that the proposed facilities were suitable for coke and sulphur storage and that the design of the storage facilities would be addressed in any EPEA approval.

9.2.4 Views of the Panel

The Panel notes that AENV considers the proposed facilities to be suitable for coke and sulphur storage. The Panel believes that the mitigative measures CNRL proposes for prevention of fires, runoff, and dust control will result in coke and sulphur being stored in an environmentally safe manner.

In response to WBFN concerns about coke pile and sulphur block fires, the Panel expects CNRL to produce and to follow its emergency response plan.

The Panel notes that the delayed coking process produces large amounts of coke, for which there currently is no off-site market. The Panel considers coke to be an energy resource and it expects CNRL to ensure that the coke is stored so as to maximize future recovery.

The Panel concludes that there are unlikely to be any significant adverse environmental effects associated with the storage of coke and sulphur, provided that the mitigation measures proposed by CNRL are implemented.

10 TAILINGS MANAGEMENT

10.1 Views of CNRL

CNRL stated that it required an external tailings pond for the first 10 years of operation. The pond would have sufficient capacity to store extraction process-affected recycle waters, Tar River water, possibly some basal aquifer water, extraction nonsegregating tails (NST), and segregating froth treatment tailings. CNRL stated that after it made sufficient in-pit space available, it would place NST in-pit. CNRL would continue to use the external pond for extraction water recycle inventory and storage of mature fine tailings (MFT) for the life of the project. CNRL stated that it would evaluate the feasibility of modifying the tailings operations and NST process and composition to consume more of the MFT formed to reduce the timing for both storage and reclamation of the external pond.

CNRL described NST as tailings resulting from a process in which the coarse sand stream and thickened tailings stream from the bitumen extraction plant would be mixed together at a sand-to-fines ratio ranging from 3.6 to 4.7 and pumped to the tailings area. If required, gypsum, carbon dioxide (CO_2), or another coagulant would be used to prevent segregation of fine and coarse particles. CNRL stated that NST would consume about 98 mass per cent of all the tailings solids. CNRL expected that NST would consolidate into a stable deposit in less than 10 years. It believed that this deposit, after appropriate capping, would be suitable for dry landscape reclamation.

CNRL stated that tailings research and development were continuing in the oil sands industry and that the use of thickeners to produce thickened fine tailings was undergoing field testing. CNRL stated that it had spent $7.8 million to date in tailings research and development. CNRL also stated that it had considered the use of paste stacking and filtered tailings to produce drier tailings and to reduce the size of the external tailings pond. However, CNRL rejected paste stacking due to its complexity, cost, and unproven performance. CNRL rejected filtration due to its mechanical complexity, the requirement to transport the filtered product, and high capital and operating costs.

CNRL concluded that in terms of technical and commercial development, NST was the most advanced demonstrated tailings management scheme available. CNRL indicated that currently there were no other economical tailings management schemes.

CNRL stated that the NRU tailings would not be thickened due to safety issues and high capital and operating costs. The NRU tailings, about 2 per cent of the total tailings solids, would be managed as segregating tailings for the duration of the mining operation. At the end of lease life, the residual NRU tailings and excess MFT, about 180 10^6 m^3, would be transferred to an end-pit lake (EPL). CNRL stated that this was a conservative number and that it had not taken into account any reduction from in situ consolidation or interlayering possibilities. CNRL stated that it would be evaluating the feasibility of modifying its NST composition to consume more of the MFT and to reduce the potential volume requiring transfer. This modification had the potential to substantially reduce the MFT to 20 10^6 m^3. CNRL noted that it would continue to work on tailings management alternatives with industry to evaluate in situ reclamation, volume reduction, and other techniques for MFT management.

10.2 Views of MCFN

MCFN expressed concerns about CNRL's need for large water withdrawals from the Athabasca River. It requested that a condition be added to any approvals requiring CNRL to commit to continued research towards reduction of water usage and elimination of massive tailing ponds.

10.3 Views of the Panel

The Panel believes that appropriate tailings management objectives for oil sands mines should be

- maximizing immediate process water recycle to increase energy efficiency and reduce fresh water import,
- reducing stored process-affected water volumes on site,
- eliminating or reducing containment of fluid fine tailings in an external tailings pond during operations,

- minimizing and eventually eliminating long-term storage of fluid tailings in the reclamation landscape, and
- creating a trafficable landscape at the earliest opportunity.

The Panel believes that CNRL's tailings management scheme is a positive development in the management of tailings. The Panel commends CNRL and believes that the proposed NST scheme takes positive steps towards achievement of many of the above objectives.

The Panel recognizes that CNRL's proposed scheme includes final storage of MFT in an EPL, and as a result the scheme will not meet the objective of eliminating long-term storage of fluid tailings in the reclamation landscape. The Panel recognizes that NST is in the development stage and that ongoing development and additional research efforts will be required to advance the NST technology to ensure that the above objectives are met.

The Panel believes that tailings management is one of the main challenges for the oil sands mining industry. This challenge remains, despite considerable efforts over more than 40 years to develop an alternative bitumen extraction or tailings management scheme that does not produce fluid fine tailings. Current tailings management results in tailings having to be impounded indefinitely and in some cases prevents reclamation of tailings areas. The challenge is more problematic since there is currently no demonstrated means to reclaim fluid fine tailings. The Panel notes that a reclamation scheme consisting of water capping of fluid fine tailings in an in-pit pond was applied for and endorsed by the EUB in *Decision 94-5: Syncrude Continuous Improvement and Development project, Mildred Lake Oil Sands Plant*, subject to successful demonstration. This demonstration is a major undertaking and is expected to occur over the next 20 years or so. In the absence of a demonstrated successful case of reclamation of fine tailings by water capping, the EUB has directed oil sands mining developers to continue to work on alternative technologies for bitumen extraction and tailings management to ensure that acceptable reclamation of all tailings deposits will be achieved.

The Panel expects CNRL to continue research and development on solid tailings technologies and to incorporate that into its existing tailings plan in order to ensure a trafficable landscape and rapid progressive reclamation (reclamation of land as soon after disturbance as is reasonably possible and in a manner consistent with the approved closure plan) and to eliminate the need for long-term storage of fluid fine tailings.

Therefore, the Panel directs CNRL to submit to the EUB on or before February 28, 2005, and every year thereafter, or such other date as the EUB may stipulate, a progress report summarizing

- research and development on solid tailings technologies, and
- modifications to the existing tailings plan to ensure a trafficable landscape, rapid progressive reclamation and to eliminate the need for long-term storage of fluid tailings.

The Panel believes that it is imperative to produce high-quality NST consistently to ensure that the objectives of a trafficable landscape that allows rapid progressive reclamation of tailings areas can be met. The Panel believes that use of 98 mass per cent of solids in NST while ensuring that the mixture consolidates and remains in a nonsegregated state would require close attention to equipment design and operation. This would require more equipment and a significantly higher service factor than is typical.

Therefore, the Panel directs CNRL to submit to the EUB two years prior to planned start-up, or such other date as the EUB may stipulate, a report summarizing the engineering design and operating plans for the NST system. The Panel also directs CNRL to submit to the EUB on or before February 28 of every year following start-up, or such other date or frequency as the EUB may stipulate, a report summarizing for the preceding year the performance of the NST system, including reasons for deviations from design.

The Panel recognizes that tailings management affects water management, energy efficiency, and the final landscape. The Panel believes that CNRL's proposed scheme is reasonable, based on current technology, but that there is a need for the regulators to ensure that CNRL and other oil sands developers manage tailings more effectively.

The Panel has considered a number of regulatory options to ensure that tailings are managed satisfactorily. In *Decision 2002-089*,[6] the EUB considered limiting the maximum amount of project disturbance, which had the effect of imposing tailings management performance requirements to some degree. In its deliberations regarding the proposed project, the Panel has considered regulating the percentage capture of tailings solids. Another option the Panel has considered is setting requirements on the utilization of the NST production system. However, after detailed review of the evidence provided, the Panel believes that it does not have adequate information to establish performance criteria for tailings management at this time. Additionally, the Panel is concerned about the potential for establishing an inconsistent set of requirements for various mineable oil sands operators by establishing criteria on a project-by-project basis. The Panel believes a uniform set of criteria would allow the EUB to regulate effectively in this area. Ideally, the criteria would be performance based, with the discretion left to operators as to how to meet them. The Panel is not in a position at this time to set such criteria, but believes that work should commence without delay to develop criteria. The Panel believes that this work could start by considering the feasibility of using factors that relate to fluid fine tailings consolidation, such as percentage of solids utilization in NST, quality of NST produced, and NST system service factor.

The Panel notes that the approval of discard management plans is the regulatory responsibility of the EUB, and therefore it is appropriate for EUB staff to lead the initiative and consult with the mineable oil sands developers as appropriate. Due to the close linkages between tailings performance and reclamation issues, the Panel believes that this initiative would benefit from the participation of AENV and ASRD, since both agencies have reclamation approval responsibilities under EPEA and the Public Lands Act (PLA) respectively. Therefore, the Panel will direct EUB staff to work with the mineable oil sands industry, AENV, and ASRD to develop performance criteria for tailings management. The Panel expects this work to provide a recommendation on the appropriate tailings management performance criteria to the Board by June 30, 2005.

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[6] *Decision 2002-089: TrueNorth Energy Corporation Application to Construct and Operate an Oil Sands Mine and Cogeneration Plant in the Fort McMurray Area*

The Panel notes that research continues on water capping of fine tailings. The Panel believes that the ongoing tailings research will identify alternative means to reclaim fluid fine tailings, perhaps at a higher cost than water capping, should water capping prove to be unacceptable.

In conclusion, the Panel believes that close attention to design and operations supported by continued aggressive research by CNRL and continued monitoring by EUB and AENV will ensure that the proposed tailings management scheme is unlikely to have significant adverse environmental effects.

11 WATER MANAGEMENT

11.1 Project Water Balance, Use, and Need

11.1.1 Views of CNRL

CNRL stated that it would use the following water conservation principles for the project:

- minimizing water intake by recycling and reusing water,
- minimizing evaporation losses by reducing the surface area of water storage ponds,
- collecting seepage losses by constructing perimeter trenches to intercept seepage for reuse,
- supplementing withdrawals from the Athabasca River with runoff from developed areas and connate water in the mined ore, and
- releasing any water to the environment in accordance with the AENV *Surface Water Quality Guidelines for Use in Alberta*.

CNRL stated that it would require 29.6 10^6 m^3 of fresh water before start-up to build recycle water inventory in the external tailings pond and 89.6 10^6 m^3 per year during start-up operations to provide for start-up contingencies. It stated that at steady-state full production, before and after NST goes in-pit, 61.3 10^6 m^3 per year would be required. An additional 19.9 10^6 m^3 per year would be required for 8 years to fill the EPLs at reclamation.

CNRL stated that it required 2.68 volumes of fresh water per volume of synthetic crude oil to operate the process on a long-term sustainable basis.

CNRL stated that its licensed annual water withdrawal from all sources, including the Athabasca and Tar Rivers, should be set at 89.6 10^6 m^3 per year. It stated that its water management plan had been revised to reflect the new mine plan, adjustments to water in tailings, and increased usage from the upper Tar River. Therefore reduced diversion would be required from the Athabasca River. The maximum annual withdrawal volume was based on stream-day water requirements for

- start-up conditions that included external tailings pond buildup inventory,
- conditions of no runoff,
- contingencies for upset operations,
- uncertainties of technology and design, and

- incremental water requirement for 60 days per year for processing low-grade oil sands.

11.1.2 Views of the Panel

The Panel has reviewed CNRL's water balance and fresh water requirements. The Panel understands that CNRL's tailings management scheme results in denser tailings and faster release of water for recycle and, therefore, a lower total make-up water requirement. The Panel notes that the requested allocation does not appear to account for the lower make-up requirement. The 2.68 volumes of fresh water per volume of synthetic crude oil to operate the process on a long-term sustainable basis is not consistent with the requirement of 61.3 10^6 m^3 per year during steady-state full production. The Panel expects that AENV, in approving CNRL's water withdrawal licence, will consider this apparent inconsistency.

The Panel notes that CNRL's tailings management scheme has the potential to reduce water use. The Panel encourages CNRL and other operators to continue to place a priority on developing strategies and technologies to reduce fresh water use, maximize reuse of process-affected water, and reduce storage of process-affected waters.

11.2 Raw Water Storage

11.2.1 Views of CNRL

CNRL proposed on-site raw water storage to minimize the effects of water withdrawal from the Athabasca River during low-flow conditions. CNRL stated that the operating capacity of its raw water pond was 1 10^6 m^3 and provided approximately 3 to 4 days of water supply to the plant at a maximum rate of 3.1 m^3 per second (s), or 17 days of water supply at the minimum water rate. CNRL noted that it required the minimum raw water withdrawal for boilers, cooling systems, and domestic uses. It stated that it could not use untreated recycled water for these purposes and that treatment was expensive. As a result, CNRL stated that it must be allowed to draw water at all times from the Athabasca River or from other fresh water sources at rates of 0.6 m^3/s in Phase 1, 1.09 m^3/s in Phase 2, and 1.2 m^3/s in Phase 3.

CNRL committed to increase the capacity of its raw water storage to 1.5 10^6 m^3 without sterilizing any additional ore or expanding its development footprint. It stated that under normal stream-day operations, this volume of water would provide 25 days of operation with no withdrawal from the Athabasca River, and even longer with a minimum withdrawal or during winter operations, when less cooling water would be required. CNRL noted that 20 days of less than 100 m^3/s of flow in the Athabasca River had been observed in a year. CNRL's raw water capacity would generally sustain it over that time frame and beyond before water withdrawal would be required.

11.2.2 Views of MCFN

MCFN expressed concerns relating to water withdrawal from the Athabasca River during low-flow periods and requested that CNRL be required to construct a raw water pond with at least 1.5 10^6 m^3 capacity.

11.2.3 Views of the Panel

The Panel recognizes that a minimum raw water withdrawal is required from the Athabasca River to feed boilers, cooling systems, and domestic use.

The Panel recognizes the concern that there may be impacts on the aquatic environment in the Athabasca River during low flow and that there may be a need to restrict water withdrawals. The results of the IFN working group study will influence water allocations and allow CNRL to confirm whether the raw water storage capacity proposed by CNRL would be adequate. The Panel notes that AENV is aware of the concerns and that it has the responsibility to assess applications for water withdrawals from rivers and the ability to manage them.

The Panel notes that the increased use of the raw water storage pond as a water source during low-flow conditions may require the rapid withdrawal of water. The Panel therefore recommends that CNRL include an analysis of the effect of rapid water withdrawal on the stability of the raw water storage dikes as part of the raw water storage pond design report submitted to the Dam Safety Branch.

12 GROUNDWATER

12.1 Views of CNRL

CNRL indicated that during development and following closure, it expected water to seep from the ETA into the groundwater system and/or discharge into the mine surface water drainage system. CNRL stated that during development, ditches would capture some of the seepage flow and direct it back to the tailings or recycle water ponds. CNRL indicated that seepage rates would decline over time as tailings consolidated and that the environmental consequences of ETA seepage on groundwater were low.

CNRL indicated that in-pit tailings seepage would occur following placement of tailings into mined-out pits. CNRL stated that depressurization activities would potentially capture seepage during development. CNRL indicated that backfilling of the mine pits with tailings would have a moderate environmental consequence on groundwater levels, flows, and flow patterns and a low impact on water quality within the basal aquifer.

CNRL indicated that basal aquifer depressurization would be necessary throughout the mine's lifetime to ensure a stable mine environment. CNRL stated that this activity would have a regional effect on groundwater levels and flows limited mostly to the western side of the Athabasca River. CNRL stated that depressurization would decrease groundwater levels in the basal aquifer, affect discharge from the basal aquifer into the Athabasca River, and induce flow from the Athabasca River into the basal aquifer between 2019 and 2036. CNRL indicated that it would mitigate the effect of depressurization by depressurizing only those areas of the basal aquifer necessary for the safe and efficient operation of the mine pits. CNRL stated that the environmental consequence of basal aquifer depressurization on groundwater flows and levels would be moderate. CNRL indicated that basal aquifer water quality within the project area might improve as a result of depressurization.

CNRL indicated that water within the basal aquifer was generally brackish to saline, in some instances would contain hydrogen sulphide gas, and was not considered a significant groundwater resource in the area. CNRL stated that it could not release this water without treatment. It proposed some combination of on-lease reinjection into the basal aquifer, treatment and use in the extraction process, and treatment and release as management options for this water. CNRL indicated that the preliminary assessment of the feasibility of basal water sands reinjection showed that the effects on groundwater were acceptable. CNRL predicted that the average depressurization rates at other developments within its groundwater RSA were predicted to increase by approximately 6 per cent because of its injection activities. CNRL stated that its predictions were based on conservative groundwater models.

CNRL stated that it would continue to gather data to evaluate and potentially reduce the uncertainties in its groundwater models and to confirm its EIA predictions through the continued investigation of the hydrogeology of the Quaternary deposits in the vicinity of the ETA and of the hydrogeology of the basal aquifer.

CNRL stated that it would undertake a comprehensive groundwater monitoring program and was willing to involve stakeholders in the design and implementation of the program, as well as to share the results of monitoring. CNRL stated that it was willing to participate in a regional groundwater-modelling program.

12.2 Views of OSEC

The Oil Sands Environmental Coalition (OSEC) indicated that it and CNRL agreed that any future plans to treat and release basal aquifer water to the Athabasca River would be subject to a separate application, require an EPEA approval, and be subject to OSEC review.

12.3 Views of MCFN

MCFN stated that it had concerns regarding the quality of the baseline groundwater data set and of the groundwater monitoring plan. MCFN indicated that a predevelopment or pristine baseline data set should have been developed for the project and that it was concerned that the groundwater monitoring program would not meet the EIA terms of reference. MCFN recommended that CNRL enhance research respecting groundwater resources in Alberta and monitoring within the project area, ensuring that MCFN was involved in the design of any groundwater monitoring programs and had access to the monitoring results.

12.4 Views of WBFN

In final argument and through questioning of both CNRL and AENV, WBFN expressed concerns that information on springs issuing from the McMurray Formation into the Athabasca River was not included in the assessment of impacts and that the springs were not monitored. WBFN indicated that it had concern that any reduction in the flow of the Athabasca River would reduce the dilution of spring flow into the river and therefore the spring flow would have a greater impact on water quality.

12.5 Views of Canada

EC noted deficiencies in CNRL's baseline water and sediment quality data set and recommended that CNRL conduct further baseline and operational water quality sampling to complete a predisturbance description of the quality of local groundwater. EC suggested that any monitoring plan should be based on a rigorous scientific design.

12.6 Views of Alberta

AENV indicated that it had several concerns regarding the potential environmental impacts of CNRL's basal aquifer depressurization activities and the management of the depressurization water. These concerns included

- the inherent level of uncertainty associated with predictive numerical modelling,
- the lack of contingency disposal options,
- the need for monitoring in order to verify the EIA depressurization and injection predictions, and
- the impact of depressurization on the Athabasca River between 2019 and 2027.

AENV agreed that CNRL incorporated conservative assumptions into its modelling, but noted that CNRL based its assumptions on limited information. AENV stated that the inclusion of certain terms and conditions in the EPEA approval relating to data collection, monitoring, and additional validation of existing modelling of impacts could address the uncertainties.

Under cross-examination, AENV addressed a number of questions regarding the impact of tailings seepage, the treatment of basal aquifer depressurization water, the impact of sulphur springs on water quality within the Athabasca River, and the responsible authority for groundwater monitoring. AENV generally agreed with CNRL that seepage from tailings areas would not significantly impact groundwater. AENV indicated that if treatment of the basal aquifer depressurization water were undertaken, the environmental impacts of the treatment system would have to be examined. AENV suggested that groundwater flow made up a small component of flow within the Athabasca River and even at low flow conditions it was unlikely that sulphur springs would have a significant effect on water quality within the river. AENV indicated that groundwater monitoring for project effects would be the applicant's responsibility.

12.7 Views of the Panel

The Panel notes that the water quality within the basal aquifer is brackish to highly saline. Whatever injection plans CNRL has for the depressurization water will require application, approval, and reporting under EUB *Guide 51: Injection and Disposal Wells.*

The Panel notes that both CNRL and AENV indicated that conservative assumptions are incorporated into the basal aquifer groundwater modelling but that uncertainties exist. The Panel is encouraged that CNRL will conduct follow-up work to better understand the hydrogeological impacts of its project and accepts that this additional work will help remove some of the uncertainties in the models. The Panel believes that activities such as depressurization and injection have the potential to affect the groundwater system within the LSA and RSA. Therefore, the Panel supports CNRL's commitment to undertake groundwater monitoring and follow-up work, as well as AENV's intentions to require CNRL to monitor and assess the impact of basal aquifer water management on the groundwater system.

The Panel notes that CNRL predicted that depressurization activities would induce flow from the Athabasca River into the basal aquifer and that AENV expressed concerns regarding this impact between 2019 and 2027. The Panel believes that the locations of the depressurization wells need to be chosen to ensure mine safety and accepts that depressurization could induce flow of water from the Athabasca River into the basal aquifer. However, the Panel notes that because CNRL predicted that depressurization volumes between 2019 and 2027 would exceed the available disposal capacity during that time period, CNRL committed either to treat and use any excess water in the process or treat and release it. The Panel believes that the disposition of the depressurization water produced between 2019 and 2027 needs to be optimized to limit any additional project impact on the Athabasca River.

The Panel concludes that with the implementation of the mitigation measure proposed by CNRL and the recommendations of the Panel, significant adverse environmental effects associated with basal aquifer depressurization and injection are unlikely.

The Panel notes that CNRL predicted that the need for depressurization would increase at other planned developments because of its injection activities. The Panel notes that CNRL believes that the predictions are conservative and that it will revise these predictions based on updated modelling. Notwithstanding, the Panel has concerns that the basal aquifer water management practices of other developers in the groundwater RSA could be negatively affected by CNRL's injection activities. The Panel directs CNRL, in consultation with developers within its groundwater RSA, to satisfy the EUB within one year of project approval on the need, or otherwise, to monitor for potential effects of its injection activities on the depressurization needs of other developments.

The Panel recognizes that both CNRL and AENV indicated that under the seepage modelling scenarios presented, ETA and in-pit tailings seepage would probably not have any significant impacts on groundwater quality. The Panel understands that groundwater monitoring will be implemented to assess the predictions regarding the impact of tailings seepage and that mitigation will be undertaken should any adverse effects be discovered. The Panel notes that CNRL indicated that it would conduct follow-up work on the hydrogeology of the Quaternary deposits in the vicinity of the ETA. The Panel recommends that AENV's Dam Safety Branch require CNRL to include updated seepage modelling results, Quaternary deposits mapping, groundwater monitoring plans, and mitigation measures as part of the ETA detailed design report.

The Panel concludes that with the implementation of the mitigation measure proposed by CNRL and the recommendation of the Panel, significant adverse environmental effects associated with tailings seepage are unlikely.

The Panel recognizes the commitment CNRL made to stakeholders regarding participation in the implementation and design of the monitoring program and sharing of monitoring results. The Panel notes that several interveners commented on groundwater data and monitoring needs and believes that AENV should address these concerns in any EPEA approval it might issue for this project. Therefore, the Panel recommends that AENV consider the involvement of stakeholders in the design and implementation of the groundwater monitoring program. The Panel notes that EC made recommendations regarding groundwater monitoring and encourages EC to provide AENV with additional information regarding its recommendations. The Panel recommends that AENV collaborate with EC in the design and implementation of the groundwater monitoring program.

The Panel notes that various groups are collecting data in order to assess the regional impact of development in the oil sands area on air, surface water, and wildlife, but that no group is currently assessing the regional impact of development on groundwater. In light of the number of developments in the area, as well as the scale of development, the Panel believes that such an initiative would be valuable in assessing all potential impacts. While the Panel recognizes CNRL's willingness to participate in the development of a regional groundwater model, cross-lease groundwater monitoring in conjunction with DCEL, and monitoring of project-scale impacts on groundwater, the Panel believes that no one organization should be tasked with undertaking a regional initiative. The Panel recognizes that an additional recommendation to regional working groups to undertake such an initiative may also not be feasible given their current workloads. The Panel recommends that AENV invite all interested stakeholders to participate in the process of assessing the need for a regional groundwater resource characterization initiative and, if the group concludes such an initiative is required, take action to have that need addressed.

13 SURFACE WATER QUANTITY

13.1 Views of CNRL

CNRL stated that the project maximized conservation and recycling of water and minimized water withdrawal from the Athabasca and Tar Rivers. CNRL concluded that the project would result in negligible adverse hydrologic effects on the Athabasca River flows and water levels due to the following mitigative measures:

- minimized water withdrawals from the Athabasca River by recycling tailings water, site runoff water, and seepage from mine pits;
- staged withdrawals from the Athabasca River during periods of low flow;
- minimized effects on flows in receiving streams by distributing muskeg drainage operations to avoid large increases in flow to receiving streams;
- minimized sediment load to receiving streams by routing surface water flows impacted by mine operations through polishing ponds prior to release to receiving streams; and
- diverting streams not disturbed by mining operations around the mining areas to receiving streams.

As a result of its mitigative measures, CNRL believed that the EIA estimated that only minor effects would occur as a result of water withdrawals from the Athabasca River, including during periods of low flow.

CNRL further described the strategies that it had considered to reduce its water withdrawal, including off-stream storage, minimization of water withdrawal during low-flow periods, and arrangements with other water licence holders. CNRL noted that it had increased the capacity of its storage pond to 25 days from 17 to address concerns about water withdrawals during low flow in the Athabasca River. As well, CNRL committed to pursuing Water Act licences that reflect long-term operational calendar-day water requirements; CNRL stated that short-term needs for start-up and commissioning would be addressed through temporary licences.

CNRL recognized and supported the work of the CEMA IFN subgroup, which was charged with determining the IFN of the Athabasca River required to sustain aquatic life and water quality. To meet possible IFN policies, CNRL committed to staged water withdrawal reduction strategies during low flows in the Athabasca River and stated that it expected any approvals that might be issued under the Water Act would include provisions to allow amendments should they be required when an IFN was determined. CNRL noted that the IFN subgroup was scheduled to complete its work by year-end 2005 and that AENV and DFO had assured the Panel that in the absence of an agreement or recommendation by the IFN subgroup, AENV and DFO had the authority to set whatever restrictions they deemed necessary. CNRL also committed to meeting IFN recommendations even if they were issued subsequent to receiving a Water Licence under the Water Act.

CNRL did not believe that it was appropriate to set an interim IFN, as there was an established CEMA process in place to address this issue. CNRL noted that the studies and consultations that were under way as part of the CEMA process would be significantly more advanced by year-end 2005, even if CEMA was not in a position to recommend an IFN as scheduled. Therefore, more information would be available to regulators at year-end 2005 if it became necessary for them to set the IFN. It was CNRL's position that a scientifically based interim IFN could not be set in the absence of these data. Further, CNRL noted that it would not require start-up water withdrawals from the Athabasca River until 2007.

CNRL stated that the EIA included a pre- and post-disturbance assessment of the hydrologic conditions within the project area, as required in the terms of reference for the EIA. The environmental baseline assessments included consideration of the cumulative effects of all existing and approved projects compared to an assessment of the potential residual effects of the project on surface water quality and quantity. Further, in response to comments that appropriate baseline conditions were not used, CNRL noted that for the Tar and Calumet watersheds, the pre-development and baseline conditions were identical. CNRL stated that the diversion of the Tar and Calumet Rivers would result in no net change in discharge to the Athabasca River. Therefore, CNRL was of the opinion that its definition of baseline conditions for its surface water assessment was appropriate. CNRL believed that the EIA predicted potential effects and addressed mitigative measures on the basis of sound baseline hydrologic data or, where data were scarce, by using conservative assumptions, such as that all land disturbances occurred at once.

CNRL was confident in the results of its flow estimates from the Hydrologic Simulation Program in Fortran (HSPF) model and asserted that it was an appropriate model for estimating long-term underlying changes in hydrologic indicators as mining activities progressed. It further explained that it selected this model because it was capable of generating flow statistics that closely approximated observed baseline conditions. Once calibrated, it used the model to generate expected future hydrologic statistics. It stated that the model was calibrated using observed flow data from 1975 to 1999 and climate data from 1953 to 1999. In response to comments that calibration using data from nonconcurrent periods was unusual, CNRL provided evidence that its method resulted in a better correlation between observed and simulated data and their confidence levels and that it predicted a drier landscape than did the more usual concurrent calibration approach. Therefore, CNRL maintained that its approach resulted in a more conservative prediction of flows and water quality and that where changes in the hydrologic regime affected water quality assessments, the model should not overpredict flow.

CNRL stated that there was no trend in lower flows in the Athabasca River as a result of climate change; it also noted that AENV had reached the same conclusion. CNRL noted that an assessment of the effects of climate change on stream flow was not required in the terms of reference for the EIA. Further, CNRL stated that current climate change models were unable to predict changes to stream flow on a watershed basis. It noted, however, that regional- or global-scale climate models generally predicted higher precipitation in the oil sands region, which was contrary to MCFN's theory of decreasing flows in the Athabasca River. CNRL stated that the suggestion that the HSPF model could be used to forecast the effects of temperature on stream flow was inappropriate, because increasing the input temperature ignored related changes to other model parameters.

CNRL responded in detail to the evidence MCFN presented to support its position that there was a decreasing trend in the lowest flow over seven consecutive days in a ten-year period (known as 7Q10) as a result of climate change. MCFN believed that CNRL's lack of consideration of climate change in its assessment called into question the conservatism in the flow estimates included in the EIA.

CNRL believed that the decreasing trend in 7Q10 asserted by MCFN resulted from the methodology used to analyze the data and was not reflective of an actual decrease in low flows. In this regard, CNRL noted that MCFN excluded data prior to 1960 due to small sample size (two points) but included data after 2000, which were of a similar sample size (three points), assumed that 7Q10 was the lowest flow in ten consecutive years, and plotted the 7Q10 against the mid-decade years, instead of the year in which they occurred. CNRL also noted that the low-flow value in the 2000/2009 decade could have a return period of greater than ten years and therefore should not have been included in the trend analysis.

CNRL noted that an appropriate trend analysis performed on annual low-flow values by fitting them to probability distributions showed no statistically significant trend. Additionally, CNRL pointed out that even if a trend were established using flow data from a specific monitoring station, the analysis should also be undertaken at additional stations to confirm the trend. It pointed out that multiple station trend analysis was performed under the Regional Aquatics Monitoring Program (RAMP) and that no trends in mean flood or low flow were identified on the Athabasca River. CNRL presented evidence that supported its position that the wide variability in historical stream-flow data made it unlikely that a trend in the data could be established over the life of the project.

With respect to hydrologic monitoring, CNRL noted that the terms of reference for the EIA did not require monitoring programs to be in place prior to receiving EPEA approvals. However, CNRL mentioned that climatic and hydrologic monitoring programs currently in place would continue at existing stations and that it would incorporate new stations to meet the requirements of its environmental approvals. CNRL noted that these approvals would contain requirements to monitor waters discharged from the project development area. This included monitoring of flows and sediment concentrations in discharge waters. Further, CNRL committed to continue its participation in the RAMP and CEMA regional programs.

CNRL indicated that it had not considered the impacts of the Bennett Dam on flows in the Athabasca River, as decreased flows in the Peace River resulting from the Bennett Dam did not impact the Athabasca River in the area of the project. CNRL noted that the RSA ended at the Embarrass Portage, as determined in consultation with regulators and stakeholders, because negligible water quality effects were predicted in the Athabasca River before the Embarrass Portage and the Peace-Athabasca Delta.

CNRL did not comment on the residual effect methodology employed in the EIA in all areas, but in response to comments on the methodology employed in CNRL's analysis of open water areas, it stated that it conducted its analysis in keeping with the guidance provided in Appendix D of the Regional Sustainable Development Strategy (RSDS). CNRL noted that the RSDS concerns about open water areas were related to changes in flow regime due to development. CNRL noted that in its closure drainage plan, open water areas were limited to 20 per cent of a watershed to ensure that evaporation did not dominate runoff and to ensure sustainability of engineered lakes and wetlands.

13.2 Views of MCFN

MCFN identified water as its primary concern about the project. MCFN was concerned that the influence of climate change on flows in the Athabasca River and the Peace-Athabasca Delta were not addressed by the EIA, as it believed that the effects of climate change would result in decreased flows in the Athabasca River. MCFN also stated that it believed that the incidence of extreme events, such as floods or droughts, would increase as a result of a warming climate.

MCFN believed that a significant decreasing trend was apparent in both mean stream flow and 7Q10 low flow in the Athabasca and that these trends were related to climate change. It believed that the omission of climate change data from the HSPF analysis made any future predictions of stream flows highly questionable. Therefore, MCFN stated that it was concerned about the impact of this project and other planned oil sands projects on the Athabasca River basin in light of the increasing trend in licences to withdraw water from the Athabasca. MCFN noted that continuation of its traditional way of life hinged on adequate water flow in the Athabasca River. MCFN stated that residents of Fort Chipewyan relied on the Athabasca River for many things, including food and transportation. Low flows could limit access to medicinal plants and herbs, spiritual and cultural sites, and trapping and hunting areas. MCFN stated that it believed that this was happening now and that the impacts would be magnified as water use by oil sands development increased.

MCFN stated that it realized that AENV had jurisdiction over the allocation of water licences. However, MCFN believed that this hearing was the only forum to voice its concerns with respect to water and to make recommendations to AENV that addressed these concerns. MCFN noted that AENV must consider the written decision of the Panel in any future review of a CNRL application under the Water Act to divert water from the Athabasca River. MCFN believed that it would not be able to appeal any future water licence that might be granted to CNRL because the issue had been previously raised at an EUB hearing.

MCFN requested a delay of CNRL's approvals and licences until an IFN had been established or an interim IFN was declared based on scientific evidence and the precautionary principle. MCFN also requested a delay in issuance of licences and approvals for the project until all outstanding gaps identified in the EIA by the MCFN were addressed. Alternatively, MCFN asked that the Panel recommend to other responsible agencies that all approvals and licences be conditioned to address gaps in the EIA and to assure prevention, mitigation, and compensation for adverse effects of the project alone or in conjunction with other projects. It specifically requested that CNRL be required to enter into cooperative management agreements with other operators and that CNRL be prohibited from withdrawing water from the Athabasca River during low-flow periods.

MCFN requested that the Panel recommend to AENV changes to the Water Act and ministerial regulation, such that

- cooperative management of water licences by oil sands operators was required,
- the transfer or sale of water licences among oil sands operators was prohibited,
- staged water licences were granted depending on applicant need and the results of the IFN, and
- no exceptions to withdrawal restrictions during low-flow periods were granted.

MCFN also requested that the Panel recommend to AENV the development of an Athabasca River Basin Regional Plan to establish policies for the management and conservation of the Athabasca River Basin, as another means of developing a cooperative water management strategy.

MCFN identified concerns about the calibration and validation of the HSPF model. It noted that the data received at the hearing satisfied many of its initial concerns about the HSPF modelling results but that this information should have been included in the EIA.

MCFN expressed concern about the methodology CNRL used to rank the impacts of the project on the environment. With respect to the hydrologic changes, MCFN noted that the EIA looked at changes in the local setting and compared these changes to a very large study area, resulting in the changes being ranked as negligible. MCFN believed that the changes should have been assessed on a more meaningful scale. For example, MCFN believed that the EIA employed an incorrect approach to calculate the net change of open water areas. It believed that the planned open water area should be compared to the current open water area, rather than to the LSA. MCFN believed that the EIA methodology resulted in an underappreciation of the magnitude of the change. To illustrate its concern, MCFN noted that the removal of the Tar and Calumet Rivers was ranked as negligible in terms of the entire study area. The MCFN also questioned the ranking of an 11 per cent decrease in flow to the Athabasca as negligible when the impact to the ecosystem was not addressed.

MCFN was also concerned about the RSA ending at the Embarrass Portage, which excluded the Peace-Athabasca Delta from the assessment area. MCFN believed that this was done to avoid the complexity of considering impacts on the Peace-Athabasca Delta.

MCFN requested that surface water monitoring programs be designed to address its questions regarding frequency and location of data collection and integrated traditional knowledge and that the data collected be accessible by MCFN. MCFN noted that it was vital to have standardized monitoring procedures in place to ensure that the project-induced changes to the hydrologic regime were captured and mitigated. MCFN also disputed the EIA position that monitoring instrumentation was unable to measure stream flow accurately due to the wide variability of the data, leading to the use of professional subjective judgement on the impact of the project. MCFN noted that although the measurement of stream flow was subject to the variability of that parameter, the measurement instrumentation was precise, and that an appropriate frequency of monitoring events reduced the need to apply subjective professional judgement.

13.3 Views of Fort McKay

The Fort McKay First Nation and Metis Local 122 noted that its agreement with CNRL contained commitments from CNRL related to surface water quantity, which included a basal water management strategy, no release of process-affected water during operations, support of the CEMA initiative to evaluate the need for an interim IFN by year-end 2003, optimization of off-stream water storage, and inclusion of Fort McKay in the design and construction of stream diversions for the project.

Additionally, Fort McKay requested that the Panel recommend to AENV that an interim IFN be established.

13.4 Views of ACFN

The Athabasca Chipewyan First Nation (ACFN) stated that it had not objected to the project application because it had reached an agreement with CNRL, which included recognition of traditional environmental knowledge (TEK) with respect to water levels in the Athabasca River, minimization of water withdrawals from the Athabasca River, compliance with the Athabasca River IFN, and no release of process-affected water during operation to surface water bodies.

Additionally, ACFN noted that it did not believe that CNRL should apply for exemptions from water withdrawal restrictions.

13.5 Views of WBFN

WBFN expressed concern that low flows in the Athabasca River had impacted the traditional way of life of its members. It believed that the impacts of the Bennett Dam should have been assessed in the EIA, as it believed that the dam was responsible for drier conditions in the Peace-Athabasca Delta. WBFN members noted that prior to flows being controlled by the dam, seasonally high water flows in the Peace River caused the Athabasca River to back up and flood the delta area, resulting in enhanced wildlife habitat.

WBFN also expressed concern that previous provincial and federal water sampling programs in the Peace-Athabasca Delta and Fort Chipewyan area were not communicated to residents in the area. WBFN also believed that CNRL could reduce demands on the Athabasca River by applying additional technology to treat water. WBFN further believed that the effects of climate change should have been considered in the EIA in order to address the observed decreasing flows in the Athabasca River.

13.6 Views of OSEC

OSEC believed that Albertans expected water to be responsibly and fairly allocated. Specifically, with respect to the oil sands area, OSEC expressed concern that Syncrude's and Suncor Energy Inc.'s (Suncor's) grandfathered water licences did not permit equitable management of water allocations in the oil sands area. OSEC believed that it was crucial that AENV treat all water users fairly in order that a consensus-based plan to manage the IFN of the Athabasca River could be established through the CEMA process. OSEC commented that the original timelines for the completion of this work would not be met and noted that a delay in establishing the IFN increased ecological and water quality risks to the Athabasca River. OSEC further explained that CNRL had addressed its concern in this area by being willing to accept a provision in its water licence that would accommodate future implementation of the IFN. OSEC also noted that CNRL had committed to pursue water licences that were in line with long-term requirements, and that CNRL would address its short-term requirements for start-up and commissioning through temporary, short-term licences. OSEC noted that this was in contrast to the current practice of including short-term water requirements on the 10-year water licence.

13.7 Views of Syncrude

In final argument, Syncrude stated that it was participating in the hearing to ensure that its approvals and investments were protected. Syncrude informed the Panel that water licences issued under the Water Act were subject to the principle of "first in time; first in right," which ensured that the allocations of earlier licensees were not impacted by future allocations. Syncrude stated that it had a statutory priority that could be overridden only in an emergency declared by the Lieutenant Governor in Council. Therefore, it was Syncrude's position that any water licence that might be issued to CNRL could not impact Syncrude's existing licence. Syncrude stated that it was its understanding that the only method by which CNRL could access existing licensed rights was by negotiating a voluntary transfer, as provided in the Water Act.

Syncrude stated that it believed that an IFN should be established through the CEMA process and that an interim IFN was not necessary, as proponents were aware that an IFN would ultimately be set and were incorporating this knowledge into future planning.

13.8 Views of Canada

DFO noted that CNRL's water withdrawal from the Athabasca River would contribute to changes in river flows and levels and therefore, recommended that the IFN for the Athabasca River be in place prior to CNRL being issued a licence for a permanent water intake from the river or allowed to operate any new permanent water intakes. DFO noted that it would cooperate with AENV in setting an IFN should the CEMA IFN subgroup be unable to fulfill its mandate on time, as preservation of fish habitat fell within its mandate under the Fisheries Act.

DFO expressed concern that CNRL used simulated and observed data from nonconcurrent time periods to calibrate the HSPF model. DFO believed that this increased the uncertainty of predictions related to flood return periods, low flows, water quality based on a changed volume of water, and fish health and tainting.

13.9 Views of Alberta

AENV stated that it believed that there were sufficient annual volumes of water in the Athabasca River to satisfy CNRL's allocation request and that of other potential users, because the withdrawals were a relatively low percentage of annual flow. However, it noted that timing of withdrawals during low flow might require careful management, as there was a potential for negative cumulative effects during low winter flows. AENV also stated that it did not detect a decreasing trend in actual stream flow from data for the Athabasca River at the Town of Athabasca or at Fort McMurray. It noted that the station at Athabasca records data similar to the station at Fort McMurray but had data available over a longer period.

AENV noted that recommendations from the CEMA IFN subgroup were expected by year-end 2005 and that an IFN strategy would be implemented soon after the conclusion of the subgroup's mandate. However, AENV also stated that it would take necessary action to ensure that IFN issues were addressed if this schedule could not be maintained. AENV also noted that it expected CNRL to continue its participation in the subgroup. AENV did not comment on the need for an interim IFN.

AENV further noted that all Water Act licences, including that of Syncrude, had some provision that allowed amendment of licence conditions to include IFN objectives. AENV indicated that any Water Act licence that might be issued to CNRL would include conditions to accommodate IFN management options in the Athabasca River. AENV did not comment on CNRL's ability to enter into a voluntary transfer with an existing Water Act licensee.

13.10 Views of the Panel

The Panel believes that the timely development of the IFN for the Athabasca River is needed to preserve the future integrity of the river. Further, the Panel believes that the current consultative process under way through the CEMA IFN subgroup is the most appropriate forum in which the scientific data can be gathered and all stakeholders' needs can be addressed. The Panel is satisfied that AENV and DFO will take appropriate action to ensure that IFN issues are addressed should the subgroup not achieve its mandate by the end of 2005, as planned. However, in view of the importance of this work, the Panel encourages all stakeholders to support the IFN process to ensure that the subgroup achieves its goal.

The Panel believes that the establishment of an IFN is critically important to mitigate against cumulative environmental effects associated with water withdrawal from the Athabasca River. The Panel notes that CNRL will not require permanent water withdrawal from the Athabasca River until 2007 and recommends that DFO and AENV assess the need to integrate the findings of the IFN subgroup into their respective authorizations that are required for the project. In view of AENV's and DFO's position on ensuring that an IFN will be established in a timely manner, the Panel does not believe that setting an interim IFN is necessary. In addition, the Panel believes that establishing an interim IFN might result in resources being diverted from the process of determining a permanent IFN. Therefore, the Panel recommends to AENV and DFO that they establish an IFN in the event that CEMA is unable to do so by the end of 2005.

With respect to Water Act licences, the Panel notes that CNRL's proposal to pursue a Water Act licence that reflects it long-term needs, while using short-term licences to address start-up and commissioning requirements, is a water management strategy that allows stakeholders, including the public, to see that allocated volumes are in line with long-term used volumes. The more common industry practice of applying for a total allocation to cover total project needs may lead some parties to believe that the entire allocated volume is being used for the entire life of the project.

The Panel notes Syncrude's argument that it has priority water rights under the Water Act for those licences it currently holds and that under the "first in time; first in right" principle, water licences issued after it was granted its licences cannot affect its earlier licences. The Panel notes that OSEC believed that this principle was contrary to the equitable use of water, but understands that AENV will recognize priority rights of all water users under the Water Act. It also notes that AENV has the ability to revise all water licences regardless of priority, should it become necessary to meet the requirements of the IFN.

The Panel also notes the concern of various parties with respect to the calibration, validation, and predictions associated with the HSPF model. The Panel believes that the initial predictions are acceptable, given the level of baseline hydrologic data currently available. However, the Panel views the modelling exercise as an iterative process that must be enhanced by additional baseline and operational data collection to ensure that appropriate mitigation can be planned. The Panel believes that the information presented throughout the hearing process indicates that additional monitoring work is necessary on a project and a regional scale to further augment hydrologic data. Therefore, the Panel concurs with the AENV, DFO, and EC position that acquisition of additional baseline hydrologic data is required to further verify the model results and recommends that any approvals that AENV and DFO might issue to CNRL include requirements for further hydrologic data collection and verification of HSPF model predictions.

On the basis of the available stream-flow data, the Panel agrees with the CNRL and AENV position that a decreasing trend in low flows is not apparent. From the evidence presented, the Panel believes that the trend presented by MCFN is a result of the manner in which the data were presented, rather than an actual feature of the data. The Panel is concerned that the trend analysis presented by MCFN was not subjected to a more rigorous statistical analysis. The Panel accepts CNRL's and AENV's position that given the natural variability of stream-flow data, it is unlikely that trends will be detected over the life of the project.

The Panel accepts CNRL's position that it is currently difficult, if not impossible, to incorporate climate change effects into watershed-scale models, but that current regional- or global-scale climate change models suggest that the climate in the project area will become wetter. The Panel accepts that these regional and global predictions will be refined as more data become available.

The Panel believes that consideration of the impacts of the Bennett Dam on the Peace River is beyond the scope of these proceedings. As the Panel understands it, these concerns are related to the impact of controlled flows on the Peace River and the effects on the Athabasca Delta, not the Athabasca River, which is the focus of the Panel's review.

The Panel notes the concern of MCFN regarding analysis of residual effects, specifically with respect to calculation of open water areas, definition of the RSA, and stream flow. The Panel believes that these concerns relate in part to the current levels of data available to assess the project and that the additional data collection and monitoring requirements that CNRL will be subject to under the conditions of its licences will assist in addressing these concerns.

Having regard for the data and analysis provided by CNRL and AENV, the implementation of mitigation measures proposed by CNRL, and the recommendation of the Panel, the Panel concludes that significant adverse environmental effects associated with water withdrawn from the Athabasca River for use in the project are unlikely.

14 SURFACE WATER QUALITY

14.1 Views of CNRL

CNRL stated that its water quality impact assessment considered all potential impacts associated with the construction, operation, and reclamation phases of its project, including cumulative effects from existing, approved, and planned projects. The assessment took into account water releases that might alter stream flows, thermal regimes and water quality in receiving waters, stream diversions and disruption of natural drainage, groundwater and surface water quality interactions, muskeg and overburden dewatering, external and in-pit tailings disposal areas, end-pit lakes, and air emissions.

CNRL used different water quality models to predict future conditions and the potential impact of the proposed project and reasonably foreseeable projects on water quality in the region. CNRL used a two-dimensional, steady-state dispersion model to predict water quality and mixing in the Athabasca River. It used the HSPF model to simulate water quality and temperature in small streams and water bodies. CNRL modelled EPLs using a flow and mass balance model. CNRL contended that the water quality component of the EIA was based on state-of-the-art modelling that incorporated conservative assumptions and accounted for any uncertainties. CNRL indicated that it performed a sensitivity analysis to determine the robustness of the HSPF water quality results and noted that the analysis considered the combined effects of all constituents. CNRL stated that this analysis further substantiated its predictions that the project would have negligible chronic toxicity effects on water quality. CNRL clarified that it used 7Q10 specifically for the worst-case design flow for water quality only, as recommended by AENV for steady-state modelling of effluent release. It stated that it made its predictions more conservative by assuming that maximum effluent flows would occur simultaneously.

Using the project development scenario to predict water quality conditions, CNRL determined that the project would either cause or contribute to some exceedances of water quality and/or human health guidelines during certain periods of time or under certain conditions in the regional watercourses. However, CNRL stated that the exceedances were primarily a result of muskeg and overburden drainage, local soil conditions, and high background concentrations of certain parameters. CNRL indicated that in the Athabasca River, all predicted concentrations would be within the range of observed natural variation. It also noted that water quality within EPLs would meet provincial regulatory requirements prior to the lakes releasing water. CNRL believed that the project was not a significant factor in causing certain predicted water quality parameter exceedances and concluded that the environmental consequences of the exceedances were negligible. It also indicated that the exceedances in water quality would not adversely affect fish or other aquatic biota according to its assessment of fish health, fish tainting, and fish tissue quality. CNRL stated that predicted exceedances of the water quality guidelines did not imply effects on aquatic biota. In order to ensure that the effects of the project releases on water quality of the Athabasca River were negligible throughout the life of the project, CNRL proposed a monitoring plan to detect changes in key water quality parameters for applicable surface waters, verify predictions, calibrate the models, and adaptively manage any changes in environmental variables.

With respect to acidification of water bodies, CNRL determined that the project would cause, or contribute to, the exceedances of the critical load[7] of the PAI in several lakes. However, CNRL noted that any potential impacts were considered reversible, as demonstrated by other studies of similarly affected lakes. The magnitude of predicted impacts on other potentially acidified lakes was negligible. CNRL acknowledged that the impact predictions on surface water acidification and aquatic life were subject to a moderate degree of uncertainty. It committed to monitor lake water quality in one of the lakes, as well as participate in RAMP's acid-sensitive lakes program, which currently samples two of the other larger lakes.

In response to criticisms that methyl mercury was not appropriately assessed, CNRL emphasized that the EIA assumed all mercury was methyl mercury, in its view an assumption that was extremely conservative in its view. CNRL indicated that it was aware of the concerns about mercury in reservoirs and acknowledged that this issue was widely known. It stated that mitigation measures were feasible, practical, and proven. CNRL would also test the vegetation and soil for mercury in the area of the proposed compensation lake prior to its filling, and it would strip and clear the area if necessary.

14.2 Views of OSEC

Acidifying emissions from the project was one of the concerns raised by OSEC. It stated that chemical changes caused by levels of acid deposition that exceeded the buffering capacity of receiving ecosystems could modify chemical and nutrient cycling and affect biota and ecosystem functioning. OSEC noted that the project would cause the critical load of one lake to be exceeded and would contribute to the critical load exceedances of 11 other lakes in the region. The majority of acidifying emissions from the project were attributed to the mining truck fleet. OSEC's favoured mitigation approach was to limit the output of PAIs.

14.3 Views of MCFN

MCFN identified water quality as an issue of concern. In its analysis, MCFN predicted that mercury levels in Calumet Lake and the proposed compensation lake would become elevated as a result of flooding the vegetation, similar to the effects observed in reservoir formation. Stripping of wetlands, which contained naturally high levels of mercury, would also result in higher mercury concentrations in receiving waters. MCFN contended that these effects were not addressed in the EIA. Consequently, MCFN questioned the ability of the proposed compensation lake to provide fish habitat. It did not consider the calculation of mercury in surface water quality samples an appropriate indicator of the potential concentrations of mercury in fish, particularly the amounts of methyl mercury. MCFN stated that methyl mercury, not total mercury, was the primary compound of concern because it was an established neurotoxin. Furthermore, small amounts of methyl mercury could cause fish tissue to exceed consumption guidelines, because methyl mercury bioaccumulates in fish, particularly in predatory fish such as pike and walleye, which are common to the region. MCFN stated that no analysis of methyl mercury was undertaken in the EIA for either water quality purposes or content in fish.

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[7] The level of acid deposition that will not cause long-term harmful effects on the receiving ecosystem.

MCFN disagreed with the evaluation of lake acidification in the EIA. MCFN stated that the forecasts were not reliable because the predictions were based on unverified models. MCFN argued that a re-evaluation of impacts on fish health was required. The EIA indicated that impacts from lake acidification were reversible. However, MCFN stated that the effects had been demonstrated to be only partially reversible and that this was substantiated by scientific literature that had not been cited by CNRL.

MCFN also questioned the predictions pertaining to water quality in EPLs. According to MCFN, the predictions were made using unverified models. It questioned the accuracy of those models and noted the lack of follow-up on previous predictions relative to past developments.

MCFN indicated that the continuation of its traditional way of life depended in part on adequate water quality in the Athabasca River. Elders noticed a change in the overall water quality over time, stating that people were no longer able to drink directly from surface water. MCFN had concerns about deteriorating water quality as a consequence of development, lack of consultation with MCFN regarding potential effects on water quality, and lack of environmental monitoring of potential effects. It recommended that additional baseline information be collected, a specific monitoring plan be established in which objectives, indicators, and performance measures were derived, and an analysis on the accumulation of methyl mercury due to wetland stripping and vegetation flooding be performed.

14.4 Views of Canada

EC explained that CNRL's water quality modelling was based on outputs from HSPF and Monte Carlo simulations, which comprised relatively few real data and included analyses with detection limits above water quality guidelines in some cases. As such, EC was uncertain about the reliability of the surface water and sediment quality assessment in the EIA. It noted the importance of collecting additional data as part of an ongoing monitoring program to reduce uncertainty over time, allow effective comparisons of conditions both before and after disturbance, and evaluate the effectiveness of mitigation measures. EC recommended that the monitoring plan be based on a rigorous scientific design with sufficient statistical power. EC did not believe that CNRL had collected adequate predevelopment baseline water quality and sediment quality data to provide the basis for comparison and to determine future sampling intensity. It recommended that CNRL conduct further baseline and operational sampling, in addition to completing a monitoring plan.

EC acknowledged that the EIA predicted some exceedances of the water quality guidelines and the chronic effects levels for aquatic biota. However, EC was unable to assess the accuracy of those predictions because of the uncertainty inherent in the predictions themselves. Furthermore, EC stated that it could not agree or disagree with CNRL's conclusion that the project would have a negligible effect on water quality due to the low number of baseline measurements and the subsequent uncertainty in predictions. It also stated that it could not be absolutely certain that the potential impacts on water quality could be mitigated. EC acknowledged the environmental risk of EPLs with respect to water quality but noted that there was legislation to ensure that poor quality water would not be released into fish-bearing waters. EC noted that any tailings release or seepage from EPLs into fish-bearing waters might constitute a violation of the Fisheries Act, which would warrant EC taking enforcement action.

EC explained that SO_2 contributed to the development of acidifying emissions in the atmosphere, and hence to acid deposition in water bodies. It emphasized the work CEMA was doing in developing a strategy to manage acidifying emissions from oil sands facilities in the region. However, EC concluded that the significant increase in SO_2 and nitrogen oxides (NO_x) emissions would increase acid deposition in the region. It recommended that all operators comply with the elements of the management strategy that would be developed by CEMA.

DFO stated that there was little information on the additive or multiplicative impacts of water quality parameter interactions. Furthermore, effects of widespread regional oil sands development on fish tainting and fish health continued to be poorly understood. It noted its concern about the release, treatment, and on-site storage of water from the basal aquifer, as those waters were highly saline and had the potential to affect fish habitat. DFO stated that if it approved the habitat alterations resulting from the project, it would include conditions to ensure that CNRL adhered to prescribed mitigation measures for the protection of fish and fish habitat, and to prescribed monitoring and follow-up studies to assess mitigation measures and verify impact predictions, and it would require CNRL to compensate for any unmitigated losses of fish habitat. DFO recommended that CNRL continue to participate in regional initiatives such as CEMA, RAMP, and the Canadian Oil Sands Network for Research and Development (CONRAD) to address water quality issues. DFO further advised CNRL to implement the recommendations and management strategies established by those groups.

DFO noted that increased water withdrawal from the Athabasca River and its tributaries would result in increased water quality impacts, particularly when combined with low-flow periods. DFO therefore recommended that CNRL undertake a site-specific long-term water quality monitoring program for the project.

14.5 Views of Alberta

AENV noted the uncertainties in water quality predictions and in landscape impacts that could affect surface waters. It also acknowledged that the water quality predictions relied on the HSPF water quantity modelling, which itself contained elements of uncertainty due to a lack of site-specific historical data and hydrologic-process information. However, Alberta believed that CNRL's predictions for the water quality characteristics were very conservative and that, as a result, the assessment identified more variables as exceeding guidelines or as being of possible concern than would actually be expected to occur. Additionally, Alberta indicated that these parameters were satisfactorily addressed in the fish health assessment. Alberta did not express concern regarding CNRL's predictions. Nevertheless, Alberta noted that monitoring was necessary to validate and calibrate the models and confirm water quality predictions. AENV indicated that it might include a monitoring condition in any Water Act or EPEA approval issued to CNRL.

14.6 Views of the Panel

The Panel notes that CNRL predicted that it would exceed several parameters of the provincial water quality guidelines for the protection of aquatic life and/or human health guidelines. However, the Panel also notes AENV's evidence that these predictions were the result of highly conservative modelling, which did not indicate an impact on receptors and did not raise a significant concern. The Panel is reassured by EC's evidence that there is adequate legislation in place to prohibit the release of poor quality water into fish-bearing waters. However, both agencies advocated a thorough monitoring program to identify and address any effects that might occur. Therefore, the Panel recommends that DFO and AENV include a condition in any approvals to be issued to CNRL that it develop and implement a comprehensive monitoring program. The Panel expects CNRL to develop such a program in consultation with EC and other affected stakeholders. The Panel supports the work being done in conjunction with RAMP; however, CNRL is ultimately responsible for implementing the monitoring program.

The Panel is aware that the water quality guidelines are intended to be broad and are not specific to the watercourses and water bodies within the oil sands region. However, the Panel notes that CEMA is currently developing site-specific water quality objectives for the lower Athabasca River. The Panel expects CNRL to support CEMA in its efforts to develop water quality objectives for the lower Athabasca River by continuing to participate and provide funding. The Panel also expects CNRL to adhere to the water quality objectives recommended by CEMA and implemented by regulators.

The Panel considered the issue of mercury and notes AENV's evidence that CNRL took a very conservative approach in its predictions. The Panel is satisfied with CNRL's proposed plan to test for mercury in soil and vegetation in the area of the proposed compensation lake and to strip and clear such soil and vegetation if necessary. The Panel expects CNRL to monitor for mercury in the proposed compensation lake from the time of filling until monitoring is no longer required by regulators.

With regard to acidifying emissions, the Panel notes that the project will contribute to the potential of water bodies in the region to be acidified. It recommends that AENV include a condition in its approval requiring CNRL to monitor for effects of acid deposition in regional water bodies.

Although there are some predicted exceedances of water quality guidelines, the Panel believes that by implementing a comprehensive monitoring plan and adaptive management strategies to ensure adherence to the water quality guidelines, the project is unlikely to result in significant adverse environmental effects on water quality.

15 AQUATIC RESOURCES

15.1 Views of CNRL

CNRL stated that its EIA included an evaluation of the baseline conditions for aquatic resources and an assessment of the potential effects of the project, in conjunction with other developments, on fish and aquatic resources. The EIA assessed fisheries habitat, water quality, and water flow levels in the Athabasca River and tributaries affected by the project, as well as potential acidifying effects on lakes and streams. CNRL stated that the project would result in the loss of parts of the Tar River and its tributaries, the Calumet River and its tributaries, a tributary to the Pierre River, an unnamed tributary to the Athabasca River, Calumet Lake, and an unnamed lake referred to as UN-7. CNRL acknowledged that the project would result in permanent alterations of some aquatic resources and have a significant impact on fish access due to the elimination of these watercourses and water bodies, but it considered the residual effects on fish habitat to be negligible based on its compensation for the productive capacity of those resources as outlined in its No Net Loss Plan (NNLP). It recognized the uncertainty associated with the effectiveness of fish habitat mitigation and compensation measures in the NNLP, but pointed out that these mitigation measures had been implemented successfully elsewhere. CNRL indicated that it did not know what effects the loss of benthic invertebrate and forage fish production would have on important domestic, commercial, and sport fish populations in the Athabasca River basin. However, CNRL believed that it would mitigate any residual losses by providing more than equivalent compensation for lost habitat.

CNRL provided a revised NNLP to the Panel and stated that its revised compensation plan would include one lake to be located on the western perimeter of the mine and within CNRL's leases. The proposed species assemblage consisted of 11 species found locally. CNRL planned to maintain its target compensation ratio of creating two habitat units for each habitat unit eliminated. It expected to construct the lake in 2005. CNRL indicated that it would form the lake by impounding the mainstem of the Tar River. The water would drain into the ETA for use as process water until closure in 2044, at which time CNRL would divert flow from the lake and discharge it into the Athabasca River. CNRL stated that it would construct a diversion channel that would facilitate fish passage. It committed to monitoring compensated fish habitats and making modifications as required.

CNRL sampled benthic invertebrates at three sites in each of the Tar and Calumet Rivers and at one site in the Ells River. It took samples from erosional and depositional sites in affected watercourses. CNRL determined from these sampling events that benthic invertebrate abundance and richness was low to moderate in these watercourses. It also examined benthic drift in the Tar River. CNRL indicated that drift density was relatively low and was generally similar to other streams in the oil sands region. It did not sample the Athabasca River directly for the project, but indicated that previous surveys of the reach adjacent to the project showed low to moderate invertebrate abundance. CNRL stated that it had not evaluated biodiversity of benthic invertebrates for the project or for the oil sands region as a whole, but noted that the data collected by RAMP could be used to estimate invertebrate biodiversity relative to other regional rivers.

CNRL indicated that the daily drift contribution from the Tar and Calumet Rivers to the Athabasca River was about 5 per cent of the Athabasca's background invertebrate drift abundance. In response to MCFN's criticisms that CNRL had not followed the requirements for identifying benthic invertebrates to the appropriate taxonomic level, CNRL indicated that MCFN had been mistaken about the requirement for species level assessments as a result of MCFN's reliance on outdated guidelines.

When questioned about its lack of specific monitoring plans, CNRL stated that there was adequate time to conduct consultation and develop appropriate programs to monitor the project effectively, verify predictions, and identify next steps. Furthermore, it argued that creating a monitoring plan before any approvals were issued was unworkable, as the monitoring program would typically be designed in concert with conditions set by both the EUB and AENV.

CNRL stated that it recognized the importance of determining IFN to assess the effects of water withdrawals from the Athabasca River on fish habitat. CNRL indicated that changes in stream flow during mine development and closure also had the potential to adversely affect benthic invertebrates, but it considered this unlikely. CNRL noted its commitment to a staged water withdrawal reduction strategy during low flows in the Athabasca River to meet possible IFN policies. CNRL also noted its commitment to regional initiatives such as the IFN subgroup of CEMA and RAMP, among others.

CNRL acknowledged that it predicted some chemical substances would exceed chronic effects levels for fish and other aquatic biota, but it did not believe that there would be any effects on fish health as a result of those exceedances. It explained that it screened the water quality predictions to determine risk to fish health by comparing indicators of toxicity to predicted substance concentrations. CNRL indicated that the fish health assessment also considered a number of other health indicators. However, CNRL noted that there were no chronic effects values for naphthenic acids and indicated that there were insufficient data to understand the toxicity of naphthenic acids. CNRL stated that fish would be exposed to higher concentrations in the Athabasca River than the concentrations of naphthenic acids predicted to come from the project. CNRL indicated that the parameters carried forward to the fish health assessment did exceed guidelines, but it stated that no parameters were excluded because data were lacking. CNRL examined those parameters assessed for their potential to affect fish on a chemical-by-chemical basis. CNRL then estimated the extent of exposure to individual fish and concluded that the project would result in negligible effects on fish health. CNRL committed to continue its participation in the Fish Tainting Working Group and to ongoing monitoring for fish tainting. CNRL stated that it would ensure that the project would not result in the tainting of fish.

When questioned by interveners about the proposed compensation lake, CNRL acknowledged that comparable compensation activities had not yet been undertaken in the region. It noted that although it had not fully determined the fish assemblage, it would include fish from a variety of sources, including native fish and potentially hatchery fish. It expected to establish the proposed compensation lake in 2005. The lake would contain self-sustaining fish populations by 2012 at the latest. CNRL stated that the compensation lake was a beneficial environmental effect of the project. It indicated that the area currently had no similarly sized lake supporting a fishery. Furthermore, it expected that the habitat created within the lake would provide habitat that was superior to that of the Tar and Calumet Rivers, which would be lost as a result of the project.

15.2 Views of OSEC

OSEC stated the importance of maintaining a minimum in-stream flow in the Athabasca River that would support fish. OSEC believed that there was a risk of losing fish habitat in the Athabasca River as a result of CNRL's water withdrawal from the river, especially during periods of low flow. It noted that the IFN subgroup of CEMA was collecting fisheries information to determine the IFN of the Athabasca River. However, it expressed concern that the results of the IFN study were not available to determine whether the predicted river flows during the life of the project would negatively affect overwintering fish habitat.

15.3 Views of MCFN

MCFN emphasized the importance of fish and fishing to its traditional lifestyle and its treaty rights to fish in traditional lands. MCFN stated that most, if not all, of its members subsisted a good portion of the time on fish and game harvested from traditional lands. MCFN indicated that its members had observed changes in the spring and fall spawning patterns of certain fish species in the Athabasca River, and it attributed this change to oil sands development. MCFN stated that fish abundance and the diversity of fish species were both declining. It expressed concern that the project would contribute additional pressure on fish populations due to increased fishing resulting from the growth in human population coupled with increased access to fishing sites. It also stated that the taste of certain fish had been affected by oil sands development and that it was concerned about the uptake of toxic pollutants by fish.

MCFN stated that CNRL's aquatic resources assessment lacked scientific rigour and that some information was inadequate, incorrect, or missing. MCFN also indicated that CNRL's assessment lacked evidence demonstrating that proposed mitigation measures would work. MCFN believed that the invertebrates collected in the assessment should have been identified to the species level, rather than the genus or family level, as was done in the EIA. MCFN stated that the science in the assessment was flawed and not defensible to the broader scientific community. Consequently, it stated that the preimpact assessment of invertebrates would be of little use in the future for evaluating the effects of oil sands development on the aquatic communities. MCFN indicated that identification to the species level would have allowed the data to be included in the RAMP database.

With regard to fish habitat in the EIA, MCFN indicated that the assessment caused MCFN to question the accuracy of the predictions because the assessment was conducted using large-scale maps and videotape recordings. Furthermore, MCFN disagreed with CNRL's conclusion that the loss of the Tar and Calumet Rivers would have a negligible impact on the Athabasca River. MCFN questioned whether destroying part of the two rivers, in an area that contained only four rivers, should be considered a negligible impact on biota. It stated that the loss of fish habitat was a certainty, but that the success of CNRL's NNLP was not. It considered the use of streams and river mouths for spawning by fish to be particularly important. It did not accept CNRL's conclusion that the NNLP resulted in positive environmental effects. It stated that the NNLP was not based on sound science and should be revisited. MCFN also took issue with CNRL's proposal to incorporate fish ladders in the NNLP. It noted that there was no evidence to support the premise that the existing fish species in the Athabasca River would successfully use the ladders.

MCFN proposed a number of recommendations pertaining to aquatic resources. MCFN requested that CNRL be required to consult with MCFN regarding any aspect of the project that might affect aquatic systems, including the design of mitigation and monitoring programs.

15.4 Views of Canada

DFO indicated that the destruction of fish habitat in the Tar and Calumet watersheds required its authorization.

DFO acknowledged that the issues it identified regarding CNRL's project reflected larger concerns common to the Alberta oil sands region, including

- incremental loss of aquatic habitat, including small watercourses, confluence habitats, wetlands, and riparian zones;
- changes in flow conditions of regional water bodies, including the diversion of water from the Athabasca River;
- changes in water quality of regional water bodies and the potential for fish health effects and fish tainting; and
- release of acidifying emissions associated with oil sands development.

DFO quantified the loss of aquatic habitat resulting from the project. It recommended that fish presence/absence be confirmed for the unnamed tributary affected by the project, Otasan Lake, Legend Lake, and Lake UN-7 prior to the start-up of the project to determine monitoring requirements. DFO indicated that it was concerned that the release, treatment, and on-site storage of the highly saline water associated with basal water sands depressurization had the potential to affect fish habitat. DFO stated that mining activities had the potential to impact riparian habitat and recommended that CNRL meet its commitment to provide a minimum setback of 250 m along the Athabasca River.

DFO noted that there were no functioning examples of EPLs on the landscape to verify the predictions made in the EIA. In the event that EPLs were not a viable option, DFO indicated the importance of developing and implementing alternative strategies prior to mine closure. DFO stated that it did not accept EPLs as compensation for fish habitat.

DFO stated that regional fish habitat would be affected as a consequence of the successive elimination of watercourses and water withdrawals from the Athabasca River. Those activities would cause a reduction in tributary habitat, reduction in benthic invertebrates, and changes in habitat as a result of decreased Athabasca River flows and water levels. Although CNRL had submitted an NNLP in accordance with DFO policy, DFO indicated its concerns regarding the high degree of uncertainty associated with predicting cumulative environmental effects. DFO also indicated that uncertainty existed in the predictions based on the hydrology assessment including fish and fish tainting. DFO believed that all incremental change predictions and concerns needed to be examined on a regional scale. It further recommended that CNRL continue to participate in existing and new regional initiatives to detect cumulative effects on the aquatic environment.

DFO believed that with the implementation of appropriate mitigation measures, follow-up and monitoring programs, and adequate compensation for habitat losses, the goal of no net loss of fish habitat could be achieved. It noted that any authorizations it issued would contain specific conditions to ensure that mitigation measures for the protection of fish and fish habitat were implemented, that monitoring and follow-up studies addressed the effectiveness of mitigation measures and verified impact predictions, and that identified habitat losses were adequately compensated for.

EC was concerned that the potential release of process-affected waters into fish-bearing watercourses and water bodies could cause fish tainting. EC noted its participation in the Fish

Tainting Committee under CONRAD. Although EC was encouraged by the progress made by the Fish Tainting Committee, it was concerned that the work of the committee would not adequately address the knowledge gaps and future research needs identified by EC.

EC noted that although analytical chemistry of naphthenic acids was lacking in the past, there had been recent progress pertaining to developments in the analysis and characterization of naphthenic acids. However, EC did not believe that there was enough information on naphthenic acids to accurately assess the effects of naphthenic acids on fish and indicated that considerably more could be done to understand the issue of fish tainting. It stated that naphthenic acids were one of the classes of compounds under consideration for research in the fish tainting program and there were ongoing discussions as to whether naphthenic acids were potent enough to cause fish tainting.

EC also emphasized the importance of understanding tainting caused by background or natural conditions and tainting from industrial sources. EC had tried to persuade the Fish Tainting Committee to advance its work in that regard. Finally, EC acknowledged the difficulty with this issue, as there was a lack of solid evidence of fish tainting and much of the evidence to date was anecdotal. EC suggested examining compounds in oil sands waste waters, as it did not believe that those waters had been previously been examined from a tainting perspective.

15.5 Views of Alberta

Alberta took the position that effects on fish populations and fish habitat would be negligible if CNRL could successfully compensate for loss of fish habitat through the NNLP. However, it noted that there was uncertainty associated with predicting project-specific and cumulative impacts on fish and fish habitat due to limitations in water quantity and water quality modelling, coupled with CNRL's evolving drainage plans and knowledge gaps in regional fish ecology. As a result, Alberta recommended that fish and fish habitat monitoring be continued through groups such as RAMP. When questioned whether RAMP conducted adequate monitoring, Alberta indicated that because RAMP was currently undergoing an academic review of its five-year report, it was reluctant to draw conclusions about the appropriateness of RAMP's program. Alberta was confident that the review would identify any gaps or deficiencies in the RAMP program.

Alberta believed that CNRL adequately addressed the water quality variables in the fish health assessments and indicated that the conclusions drawn by CNRL in its fish health and fish tissue quality assessments did not cause AENV or ASRD concerns.

15.6 Views of the Panel

The Panel recognizes that project-specific and cumulative fish habitat losses are of concern in the oil sands region. However, the Panel notes DFO's opinion that the impacts on fish habitat can be mitigated. The Panel notes that DFO expressed confidence that the goal of no net loss can be achieved. The Panel believes that a strong monitoring plan is critical to the success of CNRL's project, as was recommended by several interveners. The Panel recommends that DFO, ASRD, and AENV, in consultation with EC, include a requirement in any approval issued to CNRL to address uncertainties in the EIA by developing and implementing a comprehensive fish monitoring program.

The Panel notes that CNRL's proposed compensation lake would be the first of its kind in the oil sands region. The Panel is aware that similar lakes may be proposed in the region to compensate for other aquatic habitat loss due to oil sands development. As a result, the Panel recognizes the potential for this first large-scale example of a compensation lake to be a valuable source of information. Therefore, the Panel recommends that DFO require CNRL to share its monitoring results with other stakeholders in the region.

The Panel notes the uncertainty surrounding the issue of fish tainting. It notes evidence provided by EC regarding the difficulty in relying on predictions without having chronic effects data available and without having a good understanding of potential effects on fish due to tainting compounds. The Panel notes CNRL's participation in regional initiatives intended to address issues of water quality and fish health, and it is encouraged by the work of the Fish Tainting Committee under CONRAD. However, it also notes EC's evidence that the fish tainting program may not address knowledge gaps adequately. The Panel also recognizes that information is not being generated in a manner that sufficiently addresses current concerns. Therefore, the Panel recommends that DFO, ASRD, and AENV require CNRL to conduct follow-up studies on potential impacts of fish tainting compounds from its project on relevant fish species in any approvals issued to CNRL. Such studies would supplement existing work. Furthermore, the Panel encourages DFO and EC to increase their participation in the Fish Tainting Committee such that the information gaps and research needs identified by the Government of Canada are addressed.

The Panel notes that the issue of naphthenic acids and their potential impacts on water quality and fish tainting has been known for 20 years. While the Panel recognizes the complexity of this issue, it believes that a higher priority should be placed on understanding naphthenic acids and their impacts on fish tainting.

The Panel heard evidence that undisturbed riparian areas were necessary to mitigate the effects of the project on fish and fish habitat. The Panel notes that DFO provided evidence that a minimum setback of 250 m would protect riparian habitat. Accordingly, the Panel directs that the project area include a setback of a minimum of 250 m from the edge of the wetted width of the Athabasca River during spring flow, excluding the water intake facility. The Panel notes that other setback distances were suggested for the purposes of facilitating wildlife movement. This issue is addressed in Section 16.3 of this report.

The Panel concludes that with the implementation of CNRL's mitigation measures and the Panel's recommendations and proposed condition, the project is unlikely to result in significant adverse environmental effects on aquatic resources.

16 TERRESTRIAL RESOURCES

16.1 Land

16.1.1 Views of CNRL

CNRL noted that the project would result in the direct loss of 17 193 ha (62 per cent of the LSA) of terrestrial vegetation, wetlands, and forest resources, but that progressive reclamation would minimize the extent of surface disturbance at any one time.

CNRL noted that the reconstructed terrain would have a greater area of water and slopes that are more varied and steeper than the natural terrain. CNRL stated that 1271 ha of mineral and organic soils would be replaced permanently with EPLs at closure. CNRL expected mineral soils to increase following reclamation due to the creation of 3352 ha of reclaimed mineral soil; however, organic soils would be reduced by 4711 ha.

CNRL noted that only 10 ha of potential rare plant habitat in the LSA would be removed, representing a low environmental consequence. It also predicted negligible effects for old growth forest and changes in hydrology. The remaining terrestrial vegetation, wetlands, and forest resource components would either increase in habitat area or remain the same as a result of the project.

CNRL stated that changes in forest capability had a negligible impact over the long term, with minor short-term impacts that would be offset by the salvage of merchantable trees. It rated changes in forest capability as small, since there would be an increase in soils, which would support forestry after reclamation.

CNRL identified that there would be a loss of 3995 ha of peatlands and a gain of 1986 ha of wetlands (including a graminoid marsh) in the LSA, with a total loss of 2009 ha of wetlands (including peatlands) due to the project after reclamation. CNRL noted that the 2009 ha loss represented less than a 1 per cent change in the 1.4 million ha of wetlands (including peatlands) or the 2 277 376 ha RSA. CNRL noted that it would be replacing certain wetland types and that these would play an important role in the reclamation landscape, including attenuating floods and naturally treating water. CNRL stated that in terms of reclamation, muskeg would not be returned to the landscape in a functional capacity but would instead be intermixed with overburden and mineral soil and used as reclamation material.

CNRL stated that it considered cumulative effects to be moderate for the loss of both wetlands (including peatlands) and potential rare plant habitat. Wetlands and potential rare plant habitat would each experience a 3 per cent decrease in area in the RSA, with less than 1 per cent of this attributed to the project.

CNRL stated that it assessed fragmentation for undisturbed, forested, riparian, and old growth areas. The project resulted in an 11 per cent reduction of forested areas, an 11 per cent increase in riparian areas, and a 5 per cent decrease in old growth forest, measured as a percentage of the LSA. Reclaimed ecosystems would have a structure capable of supporting old growth forests beyond closure (100 to 140 years).

CNRL stated that it was committed to the environment and would actively participate in regional committees that addressed monitoring of terrestrial vegetation, wetlands, and forest resources in the oil sands region. Project-specific measures would include monitoring of soil and vegetation re-establishment on reclaimed sites and monitoring programs designed to provide feedback to management systems on the effects of development and mitigation activities.

CNRL also stated that it would be involved in research programs such as CONRAD to resolve uncertainties associated with reclamation. CONRAD's research would examine the benefits of shallow topsoil salvage, correlating and classifying reclamation soil prescriptions with land capability and forest development, reclamation techniques to return bog and fen peatlands, examining the effects of salinity from NST and process water, and assessing a model for determining the sustainability of reclaimed soil series.

CNRL noted that its C&R plan was a key mitigation strategy. It would be designed to minimize disturbance to terrestrial vegetation, wetlands, and forest resources and to re-establish resources to equivalent predevelopment capability. The closure landscape would reflect a diverse environment and would include varied topography, natural vegetation units, wetlands, and EPLs. It planned long-term monitoring as a part of the project to ensure that the soil reclamation procedures returned an equivalent capability.

Specific mitigation would include

- avoiding or reducing incremental impacts by reusing previously disturbed areas (e.g., linear corridors) where possible;
- practicing progressive reclamation techniques and direct placement of soils where practical to preserve the natural seed bank and viable root fragments, thereby enhancing diverse native vegetation regeneration;
- conserving, restoring, and replacing topsoil and surface organic material to specified depths to attain appropriate land and soil capability classes for forestry;
- leaving islands of undisturbed vegetation where practical for rapid recolonization; and
- reconstructing early successional ecosite phases that would succeed to sustainable vegetation communities.

16.1.2 Views of MCFN

MCFN stated that although the contribution of a single development probably had relatively little effect on ecosystem processes, as few as two projects could significantly push the ecosystem function in the area into a new ecosystem configuration.

MCFN noted that there was a distinct threshold of land cover cleared, approximately 50 per cent, at which point landscape configuration and ecosystem processes changed. As forests were cleared, forest patch numbers increased while patch size decreased until a maximum number of forest patches were reached at about 50 per cent. This affected the diversity of species across the landscape and might represent a sudden shift from one ecosystem to another that could be irreversible.

MCFN stated that the project would not be completed until 2045 and that reclamation would be complete within 80 years. In the meantime, the project lease would be reduced to craters and pits. Cumulatively, the disturbance could be as large as 4700 km^2.

MCFN stated that the importance of the current wetland types on the CNRL lease was their ability to hold water and act as a natural water treatment system for the environment. MCFN indicated that CNRL planned to replace the existing wetlands with cattail wetlands, which would not function in the same manner.

MCFN recommended a review of current wetland protection plans, policies, and legislation. It requested that MCFN be afforded an opportunity to provide input and review any changes that occurred as a result.

MCFN noted that CNRL's statement that "land productivity and diversity would be restored to predisturbance capability" remained unproven and unsubstantiated. It stated that some wetland types in particular had proven difficult to reclaim.

MCFN also noted that there was a limited ability to return land disturbed in oil sands mining operations to equivalent capability. It was concerned that this would be an economic decision for CNRL and not an environmental/reclamation question.

16.1.3 Views of OSEC

OSEC indicated that the cumulative surface disturbance in the oil sands region represented a significant impact on the boreal forest. OSEC was concerned that the cumulative disturbance in combination with the loss of wetlands in the Fort McMurray region could be significant. It noted that the CNRL mine would add 17 193 ha to the 180 000 ha of planned regional disturbance and that although CNRL planned to use progressive reclamation, the majority of reclamation was not scheduled to occur until after 2030.

16.1.4 Views of Canada

EC stated that wetlands and peat sequestered mercury and sulphate and that the lands in the area of wooded fens contained high dissolved organic compounds.

EC noted that the removal of wetlands would have a significant adverse environmental effect on wetland function at the local level. EC stated that monitoring would be important to confirm that wetland function would be restored and maintained in the reclaimed landscape to the greatest extent possible. EC stated that the EIA dealt with wetland issues adequately.

16.1.5 Views of Alberta

ASRD noted that it had responsibilities under the PLA to regulate and direct conservation and reclamation activities, authorize the use of public lands, regulate CNRL's vegetation removal, aggregate management, and conservation and reclamation activities, and manage the conservation and reclamation of CNRL's mineral surface leases in conjunction with AENV.

ASRD also noted that it had regulatory, resource management, and planning responsibilities to regulate the removal and use of forest resources and to provide direction for reforestation during reclamation under the Forests Act.

16.1.6 Views of the Panel

The Panel notes that CNRL's mitigation of environmental effects relies heavily on its C&R plan, which requires CNRL to succeed in reclaiming the landscape to equivalent land capability. The Panel also notes that there remains a significant amount of uncertainty in the ability of industry to achieve adequate reclamation. Further expectations of the Panel regarding reclamation are detailed in Section 16.4 on Reclamation.

The Panel notes the concerns of MCFN and EC about the loss of wetlands. The Panel believes this is necessary to recover the oil sands resource. The Board notes that 50 per cent of the wetlands area lost would be reclaimed as wetlands. The Panel also notes that the cumulative reduction of wetlands and areas of rare plant potential is small on a regional scale. The Panel recognizes that it is not possible to completely duplicate the functioning of the original wetland landscape through the current suite of reclamation techniques and that some loss of wetland function will occur in the reclaimed landscape. The Panel recommends that ASRD and AENV identify this area of wetlands research as a priority for CEMA to address. AENV should also consider requiring CNRL to develop and initiate programs to facilitate wetlands restoration. Should wetlands restoration methods prove to be technically and economically feasible using stripped organic matter, there is further potential for the seedbed to regenerate native and rare plants. However, the Panel notes that CONRAD and CEMA are currently working to develop new techniques and reclamation processes for maintaining, saving, and reclaiming fens and bogs. The Panel expects that as new techniques are developed, they will be adopted by industry and applied appropriately through EPEA approvals and C&R plans.

The Panel believes that CNRL adequately dealt with the issue of ecosystem shift. CNRL acknowledged that it would not be returning an identical ecosystem to the landscape, but rather an ecosystem with similar functions. The Panel notes that CNRL has made significant commitments to monitor for early detection of unexpected ecosystem responses and to mitigate and adaptively manage as required. The Panel supports the development of a comprehensive monitoring program to detect these changes.

The Panel concludes that with the successful implementation of CNRL's mitigation measures, further research, and the Panel's recommendations, it is unlikely that the project will have significant adverse effects on terrestrial resources.

16.2 Wildlife

16.2.1 Views of CNRL

CNRL stated that the wildlife assessment for the local and regional effects of the project considered changes to habitat (loss and fragmentation), barriers to movement, and wildlife mortality resulting during construction, operation, and reclamation. It conducted the assessment for 14 wildlife species that represented the key indicator resources (KIR).

CNRL stated that local habitat loss due to the project would be high for all wildlife KIRs, with habitat loss ranging from 60 per cent (Canadian toads) to 70 per cent (muskrats). However, habitat gains at closure, as a result of reclamation, would be high for most KIRs. CNRL stated that it expected habitat loss in the RSA under the Planned Case for all KIRs to have low effects.

CNRL stated that the residual impacts of barriers to wildlife movement would be negligible locally for most KIRs. CNRL stated that residual impacts of direct mortality from site clearing, increased potential for nuisance wildlife, and interaction with infrastructure would be negligible for all KIRs considered. CNRL noted that residual impacts of increased predation, hunting, and trapping from improved access would be negligible for all KIRs except for moose and bears, which would be low.

CNRL stated that it was committed to wildlife monitoring. A wildlife monitoring program would be developed in consultation with regulators and would include regional wildlife initiatives. The wildlife monitoring program would include monitoring for listed species, reclamation success, and wildlife movements.

CNRL stated that its key mitigation would be its C&R plan. It planned a diverse environment for the closure landscape, which would include a varied topography, natural vegetation units, wetlands, and EPLs.

CNRL stated that mitigation measures included

- avoiding or reducing effects on special status species where practical;
- reconstructing early successional ecosite phases that would sustain vegetation communities;
- minimizing the effects of barriers on wildlife movement;
- managing mortality for nuisance wildlife;
- minimizing the effects of wildlife interactions with infrastructure, including those put in place for transmission lines, communication towers, and tailings ponds;
- managing the effects of potential increased predation/hunting/trapping as a result of changes in access and human use; and
- reducing vehicle-wildlife collisions.

CNRL also stated that it intended to undertake additional mitigation measures to address potential bird mortality due to tailings ponds, including the installation of bird deterrent systems and specialized sound systems to deter nonwaterfowl bird species.

CNRL concluded that no residual significant adverse effects on wildlife would occur within the project area and that no significant effects on wildlife would occur within the region.

16.2.2 Views of MCFN

MCFN stated that it wanted CNRL to research the adverse effects the improved access for nontraditional users to remote areas would have on fish and wildlife populations and to propose a solution.

MCFN stated that cumulative oil sands activities in the mineable area could clear more than 50 per cent of the land cover over the next 20 to 40 years, causing fragmentation and possibly an ecosystem shift that would affect wildlife core security and composition in the area.

16.2.3 Views of Canada

EC stated that it had not identified any issues under the Species at Risk Act arising from the project. It was possible that there may be species at risk on the lease area, but in the unlikely event that one was encountered, CNRL was expected to take appropriate measures.

EC noted that the monitoring of the trend and populations of breeding birds in the RSDS study area was essential. EC stated that there were no timelines or work plans under CEMA's

Sustainable Ecosystems Working Group (SEWG) to undertake the completion of monitoring of bird indicator species. Therefore, EC recommended that prior to project construction, CNRL provide the design and implementation schedule of a long-term monitoring program for the LSA for listed species, and Priority 1 and 2 indicator species identified by the CEMA Wildlife and Fish subgroup.

EC stated that the final landscape contained EPLs and that if CNRL's modelling was incorrect, the water quality could be poorer than predicted and could lead to potential adverse effects on wildlife. EC recommended that CNRL conduct long-term monitoring of the buildup of contaminants in EPLs and the potential for effects on migratory birds.

EC commented that given the projected loss of forest bird habitat sites, CNRL's development activities should be timed to avoid critical periods for migratory birds and other wildlife. EC recommended that vegetation clearing activities avoid the April 1 to August 31 time period.

16.2.4 Views of Alberta

ASRD noted that under current regulations, policies, and the Wildlife Act, it would provide advice and direction to CNRL on mitigation and other measures to support the sustainability of wildlife resources. ASRD would also monitor CNRL's management strategies and practices.

16.2.5 Views of the Panel

The Panel notes that impacts of the project on wildlife KIRs are generally predicted to have a low environmental consequence in a regional context.

The Panel recognizes that active mining areas remove wildlife habitat for some time and that CNRL is depending on the effectiveness of reclamation to mitigate wildlife issues. The Panel believes that with the implementation of appropriate mitigative measures, impacts can be kept to an acceptable level. The Panel acknowledges that CNRL developed a general list of mitigation measures that may reduce impacts on wildlife.

The Panel recommends that AENV and ASRD include EC in their discussions with CNRL to determine acceptable monitoring and mitigation requirements for wildlife.

The Panel concludes that with the implementation of CNRL's mitigation measures and the recommendation of the Panel, the project is unlikely to result in significant adverse environmental effects on wildlife.

16.3 Wildlife Corridor

16.3.1 Views of CNRL

CNRL stated that the wildlife corridor described in its EIA was 250 m from the top of the escarpment to the mine pit boundary, with an additional 100 to 150 m buffer from the Athabasca River to the top of the escarpment. The 100 to 150 m distances between the river and the escarpment varied along the length of the Athabasca River. At some points along a 2 km stretch of the Athabasca River where the distance between the river and the escarpment was minimal, the total setback distance could be as narrow as 250 m. CNRL stated that the wildlife corridor did not include a provision for the permanent water intake structure that would be positioned within this buffer zone. However, CNRL noted that the intake structure could be built with minimal impact on the corridor.

CNRL noted that additional work was required to confirm that the proposed wildlife corridor would be sufficient and stated that it would not be encroaching on the corridor until 2015. CNRL committed to work with interested stakeholders to conduct additional work to either confirm or revise its wildlife corridor plan.

16.3.2 Views of OSEC

OSEC stated that oil sands developments, including the proposed project, would compromise the integrity of riparian habitat and wildlife movement corridors critical to the viability of many wildlife populations.

OSEC believed that CNRL recognized the importance of this issue because CNRL had committed to undertake a wildlife movement study. OSEC noted that this should be a scientifically defensible evaluation of the effective corridor width needed to allow wildlife movement. OSEC expected that the development of an effective corridor width would be represented in the annual mine plans presented to the EUB and that the annual mine plans would be approved accordingly.

16.3.3 Views of MCFN and WBFN

MCFN and WBFN indicated concern about the adequacy of the proposed wildlife corridor, since there was minimal science available. MCFN asked to be involved in the development of appropriate monitoring programs for wildlife corridors.

16.3.4 Views of Canada

EC stated that the lack of information on the characteristics of effective wildlife corridors in the boreal forest limited the ability of CNRL and regulators to be certain of the appropriateness of CNRL's wildlife corridor plans.

EC recommended a minimum no-development setback from the Athabasca River (including utility corridors) of 400 m of upland forest plus the sloping valley sides. EC also recommended that CNRL lead an effort, in partnership with other developers operating in the region, to collect baseline data on wildlife use of river valleys and adjacent upland habitats and to study wildlife use of corridors that have been and would soon be created during the construction of oil sands mines.

EC stated that it understood the need to balance social, economic, and environmental issues in determining the appropriate width of a wildlife corridor.

16.3.5 Views of Alberta

Alberta stated that river valley ecosystems were important habitats for many wildlife species. River valley setbacks and habitat corridors were considered to be important components of wildlife management, particularly in landscapes altered extensively by human activities.

ASRD noted that during the hearing, CNRL referred to a width of undisturbed corridor that was different from what was proposed in the application and that the corridor could be reduced to 250 m at some points. Alberta understood from CNRL's application that there would be an undisturbed 400 m wide corridor. Alberta would consider a 400 m setback a positive step towards maintaining wildlife habitat values and connectivity along the Athabasca River valley.

ASRD indicated that the project activity did not contribute significantly to cumulative effects on key habitats and habitat connectivity for key wildlife species. But it also stated that the increased level of disturbance coupled with the potential for long-term cumulative impacts on habitat connectivity was not well understood and could influence natural dispersal patterns and seasonal range distributions for some species of wildlife, in particular, medium to large mammals.

ASRD indicated that although a continuous, effective valley corridor had already been compromised along the Athabasca River, additional mining disturbance within and adjacent to the valley would add to the cumulative effect by increasing the total disturbance area and period of impact. Alberta recognized that while river valley ecosystems were important and the widest possible setback from disturbance would achieve the maximum benefit for wildlife and biodiversity, the decision on river valley habitat corridors must also consider the value of bitumen reserves in the same location.

ASRD requested that the Panel require CNRL to undertake and lead a research and monitoring program, preferably in cooperation with other oil sands developers and stakeholders, to examine wildlife responses and effective setback distances for movement corridors in the oil sands area and to examine other potential mitigation and reclamation measures. This program could be accomplished through existing regional stakeholder forums, such as CEMA. Alberta stated that CNRL must be held accountable to ensure that the research program was completed in a timely manner. In addition, findings of this study could be used to review and revise the proposed wildlife corridor or include other forms of mitigation for the project. Alberta suggested that such changes be explored collaboratively with CNRL, the EUB, and ASRD to ensure an adaptive approach that would maximize corridor benefits within the context of the project.

ASRD also recommended that the Panel require CNRL to submit a cooperative research proposal for review and acceptance by the Director of Wildlife Management and to initiate a program within 12 months after receiving regulatory approval from the EUB. Preliminary results of this research program should be made available within 48 months following regulatory approval to help direct decisions regarding effective setbacks and wildlife corridors for this project and other future oil sands mining applications.

16.3.6 Views of the Panel

The Panel notes that there is significant uncertainty regarding the appropriate width and design of wildlife corridors in the mineable oil sands area. It also notes that there was agreement among the interveners and CNRL that additional work is required before an appropriate width can be determined. The Panel acknowledges CNRL's commitment to undertake the work in a timely manner and to involve both regulators and stakeholders. The Panel supports Alberta's position to require CNRL to do a wildlife movement study.

The Panel notes that CNRL has committed to a 250 m buffer to protect riparian habitat along the Athabasca River. This buffer would also effectively provide a minimum 250 m wildlife corridor. The Panel acknowledges that CNRL would not be affecting the expected wildlife corridor area physically until 2015, leaving CNRL sufficient time to determine the width of its wildlife corridor. The Panel expects CNRL's annual mine plans to reflect any changes in mine design resulting from changes in wildlife corridor design and width.

The Panel acknowledges that there are a significant number of issues to be considered in the determination of an appropriate wildlife corridor width, including but not limited to the balance of resource recovery versus the effective protection of wildlife movement. The Panel expects that the EUB will provide oil sands resource information to assist CNRL's initiative.

The Panel concludes that with the implementation of CNRL's mitigation measures, additional research, and the implementation of the Panel's recommendations, the project is unlikely to result in significant adverse environmental effects on wildlife movement.

16.4 Reclamation

16.4.1 Views of CNRL

CNRL stated that it expected its current resource delineation and mine plan to disturb up to 17 193 ha of land over the life of the project. CNRL's progressive reclamation would commence within 10 years of mining, with the ultimate objective of tailings placement to create a stable trafficable deposit amenable to dry landscape reclamation as quickly as possible. Additional reclamation techniques that might be used to improve the likelihood of success included direct placement of surface materials, storage of woody debris for future reclamation, salvage of shallow soil layers, and conservation of peat materials.

CNRL committed to minimizing the surface disturbance footprint of the plant, mine, and tailings-handling facilities. CNRL expected that by 2030, up to 10 per cent of the disturbed area would be in various stages of reclamation. CNRL expected that through continued research, collaboration with industry, consultation with stakeholders, and ongoing monitoring and review, it would be able to restore the land to equivalent or better capability than the original.

CNRL committed to participate in reclamation research programs, improve reclamation practices continuously, undertake an integrated reclamation monitoring program, and participate in existing regional reclamation monitoring programs. CNRL committed to submit annual reports to AENV that documented development and reclamation activities at the project.

CNRL stated that its proposed NST tailings management disposal scheme was a significant advancement in the management of tailings. It had the benefits of

- minimization of surface land disturbances,
- a major reduction of MFT volumes,
- reduced water requirements and additional opportunities to recover waters suitable for reuse, and
- improved, more rapid reclamation to a trafficable and contoured landscape.

CNRL also indicated that there would be opportunities to review and revise its reclamation plans as development progressed and that it was committed to an open and transparent process involving all interested stakeholders.

CNRL stated that through progressive reclamation the land would be put back to an equivalent, or in some cases, better land-use capability. CNRL noted, however, that it could not duplicate the existing ecosystem and that reclamation of the project area would result in a change to the relative percentage of ecosystem types on the lease.

16.4.2 Views of OSEC

OSEC indicated that the cumulative surface disturbance in the oil sands region represented a significant impact on the landscape of the boreal forest. OSEC was concerned that the cumulative disturbance in combination with the loss of wetlands in the Fort McMurray region could be significant. OSEC noted that the CNRL mine would add 17 193 ha of disturbance and, although CNRL planned to use progressive reclamation, the majority of reclamation was not scheduled to occur until after 2030.

OSEC stated that to date very little area directly affected by oil sands mining operations had been restored to land with capability equivalent to the premining conditions and no oil sands operations had yet received a reclamation certificate from the Government of Alberta.

OSEC had concerns that decision-makers were allocating terrestrial resources to the oil sands industry in the absence of information on the region's terrestrial carrying capacity or demonstrated ability to reclaim lands affected by oil sands mining to certification standards.

16.4.3 Views of MCFN

MCFN stated that it was concerned that there were no reclaimed pits in the oil sands region and that the government continued to approve mining projects. MCFN questioned when government would certify that the land could be reclaimed.

MCFN stated that CNRL's commitment to design and implement a reclamation plan that would restore as many of the ecological components of the boreal environment and landscape as feasible was too vague. MCFN noted that there was a limited ability to return land disturbed in oil sands mining operations to equivalent capability, and it was concerned that this would be an economic decision for CNRL, not an environmental or reclamation question.

MCFN stated that CNRL did not adequately assess ecosystem shift and that the information about how ecosystem shifts affect reclamation success was incorrect, incomplete, or nonexistent.

MCFN noted that as a result of ecosystem process changes, ecosystem services were reduced or altered. The services could include the purification of air or water. MCFN stated that it had been determined that such shifts caused by humans could be irreversible and, therefore, in MCFN's view, it would be prudent to avoid an ecosystem shift rather than attempt to deal with it afterwards.

16.4.4 Views of Alberta

Alberta stated that the project would be subject to existing legislative requirements to ensure minimal disturbance and successful conservation and reclamation to re-establish a landscape having land capability equivalent to predisturbance.

16.4.5 Views of the Panel

The Panel acknowledges that the reclamation of oil sands mines is a significant issue. It is encouraged that CNRL has adopted progressive reclamation and that it is proposing an NST management disposal scheme for the majority of its tailings.

It is the Panel's view that although land reclamation and associated issues are regulated under EPEA, the reclamation planning and final landscape objectives are important considerations when the Panel is determining whether an oil sands development is in the public interest.

The Panel is aware that while some overburden disposal sites within the mineable oil sands area have been reclaimed, none has been certified. The Panel also notes that no tailings sites within the mineable oil sands area have yet been reclaimed. However, the Panel also notes that the nature of oil sands mining development inherently requires large areas of disturbance that may remain on the landscape over an extended period of time.

The Panel understands that CNRL has put a great deal of reliance on its progressive reclamation plans to mitigate environmental impacts of the project. A large component of achieving progressive reclamation depends on successful tailings management, reducing or eliminating fluid-based tailings, and timely implementation of reclamation practices. This would facilitate reducing long-term environmental liabilities, improving water management, and increasing certainty in the near term that reclamation objectives can be achieved cost effectively. The Panel notes that in Section 10 of this report it directs EUB staff to initiate work with oil sands operators to develop performance criteria for tailings management. The Panel recommends that AENV and ASRD consider whether additional criteria could be developed for progressive reclamation to complement the proposed tailings management criteria.

The Panel notes that CNRL identified the potential to reclaim a portion of its tailings pond prior to the end of the project life, promoting additional progressive reclamation. The Panel encourages CNRL to continue to investigate this option and implement earlier reclamation.

In the absence of environmental thresholds or management objectives from CEMA, the Panel believes it prudent to adopt a precautionary approach on the issue of reclamation. The Panel believes that to the extent allowed by current technology, the oil sands industry should minimize the total amount of land disturbed at any given time and that operators should strive to reclaim disturbed lands as soon as possible.

The Panel notes that there are opportunities for CNRL to revise and improve its reclamation plan through the annual mine plan and 10-year C&R plans, as its project progresses and additional knowledge is gained through continued research and development on tailings.

16.5 End-Pit Lakes

16.5.1 Views of CNRL

CNRL stated that EPLs would be part of its reclaimed landscape. CNRL noted that EPLs in combination with wetlands had long retention times, allowing biodegradation of organic substances; large water volumes, providing dilution of reclamation waters; and low flow velocity, promoting settling of suspended particulate substances. CNRL committed to ensuring that any discharges from the EPLs would meet *Alberta Surface Water Quality Guidelines* or the guidelines in force at the time of release.

CNRL modelled EPLs using a flow and mass balance model. CNRL noted that the water quality component of the EIA was based on state-of-the-art modelling, which incorporated conservative assumptions and accounted for any uncertainties.

CNRL stated that the EPLs would support viable, self-sustaining sport fish populations and would be built according to the CEMA EPL Working Group design and operational specifications. CNRL stated that it was committed to participating in research programs through CEMA and CONRAD to ensure that its EPLs would meet all regulator and stakeholder goals.

16.5.2 Views of MCFN

MCFN questioned the predictions pertaining to water quality in EPLs. According to MCFN, the predictions were made using unverified models. It questioned the accuracy of those models and noted the lack of follow-up of previous predictions relative to past developments.

16.5.3 Views of Canada

EC acknowledged the environmental risk of EPLs with respect to water quality but noted that there was legislation to ensure that poor quality water would not be released into fish-bearing waters. EC noted that any tailings release or seepage from EPLs into fish-bearing waters might constitute a violation of the Fisheries Act, which would warrant EC taking enforcement action.

DFO stated that there were no functioning examples of EPLs from which to verify CNRL's EIA predictions. DFO stated that in the event that EPLs were not viable, sufficient time would be needed to develop and implement alternative strategies prior to mine closure. DFO expressed concern that the lack of empirical evidence supporting the performance of EPLs could lead to a lack of viable options at the time of mine closure unless all stakeholders made EPL research a priority.

DFO recommended that ongoing research into the design and function of EPLs be continued and expanded. DFO also recommended additional research on mining and recovery options to reduce or eliminate the need for EPLs.

16.5.4 Views of Alberta

Alberta stated that the viability of EPLs as a sustainable ecosystem in the closure drainage landscape had yet to be demonstrated. Uncertainty in EPL design, functionality, and water quality were identified under RSDS as significant issues. Alberta believed that the pace of work currently being carried out under CEMA on the theoretical development of EPLs and guidance document was appropriate.

Alberta stated that CNRL's predictions regarding the function of the closure drainage landscape were reasonable, based on the information currently available. Alberta stated that given the complexity and uncertainty about EPL function, continued priority should be given to ongoing research.

Alberta stated that validation of EPL models would require a physical test case and that it might request CNRL to provide a research schedule for the construction of a field pilot in partnership with other oil sands companies to test EPL predictions and design features.

16.5.5 Views of the Panel

The Panel acknowledges that EPLs are a complex and still relatively unproven reclamation method for dealing with process-affected water and tailings. The Panel recognizes that the oil sands industry as a whole needs to take greater responsibility in addressing the issue of EPLs and moving towards larger scale field testing.

The Panel agrees that a demonstration test is necessary to further advance knowledge about EPLs. The Panel supports AENV's intention to require CNRL to provide a research schedule that includes the testing of EPL predictions and design features with a physical test case in partnership with other oil sands companies. The Panel expects that this work would be completed in the next 15 years. Therefore, the Panel recommends that AENV monitor EPL development and testing.

The Panel concludes that with the implementation of CNRL's mitigation measures and the recommendation of the Panel, EPLs are unlikely to result in significant adverse environment effects.

17 AIR

17.1 Views of CNRL

CNRL stated that it modelled both project and regional emissions to evaluate the effects on humans, wildlife, and aquatic health, as well as the potential acidifying effect on lakes, streams, soils, and vegetation. It believed that there would be no unacceptable effects associated with its project. CNRL stated that the project design included several enhancements to address environmental effects that in some cases exceeded EUB requirements, including the following:

- It would design its sulphur recovery technology to achieve a 99.2 per cent sulphur recovery level. However, CNRL stated that this would be a design target and that it expected to receive approval for the lower regulatory recovery level of 98.8 per cent set out in EUB *ID 2001-3*.
- Mine vehicles would meet the U.S. Environmental Protection Agency Tier 2 emission standards for nitrogen oxide and that low NO_x burners would be used.

- It would install two NRUs and would hydrotreat make-up diluent to remove sulphur compounds. This would help to minimize odours and reduce tailings emissions.

CNRL stated that it would continue to review emissions control technology and implement those that had value and met economic criteria. It stated, for example, that CNRL and other industry members had put pressure on engine suppliers for better engine performance.

CNRL stated that there was a potential to exceed the one-hour Alberta Ambient Air Quality Guideline for SO_2 should acid gas be flared as a result of plant upsets. It stated that in the event of an upset, it planned to bring the plant back into operation quickly and flare the least amount possible. CNRL intended to have a monitoring trailer between its operations and Fort McKay, as well as a notification system as part of its emergency response plan to address potential risks associated with flaring.

CNRL stated that the project was designed to achieve industry-leading energy efficiency and sector-leading greenhouse gas emission intensity. It stated that it would review new technology for subsequent phases to realize continuous improvement in energy efficiency and emissions reductions; however, it did not commit to future targets.

17.2 Views of OSEC

OSEC stated that its bilateral agreement with CNRL included air emissions issues. It stated that it was concerned about increasing acidifying emissions in the oil sands region and the expanding area predicted to receive those emissions. It stated that best efforts should be made to reduce NO_x emissions. It noted that CNRL had committed to reviewing burner and mine fleet emissions control technologies.

OSEC pointed out that the majority of acidifying emissions from the project was attributed to the mobile mine equipment. OSEC stated that its favoured mitigation would be to limit acidifying emissions. It noted that CNRL had committed to purchase low NO_x and SO_2 emission engines in 2008. OSEC stated that the greenhouse gas management aspects of its agreement with CNRL were a step forward in addressing a significant deficiency of the application. It stated that CNRL had agreed to establish continuous improvement targets for reduction of greenhouse gas intensity by 2005.

17.3 Views of Canada

EC noted that emissions from oil sands mining activities contributed to a number of important air issues, including acid deposition, smog, toxic air contaminants, and climate change. It stated that the NO_x-SO_2 Management Working Group had completed and was continuing work to close knowledge gaps related to air issues. It stated that complex interrelationships with sources in the region made it difficult to evaluate impacts from individual emitters. EC stated that it was important to shift from project and individual emissions species evaluations to a broader cumulative effects approach.

EC recommended continuous monitoring of nitrogen dioxide (NO_2) and NO_x within the oil sands region to validate near-field modelling of baseline and cumulative environmental assessment conditions, as well as to assess the effectiveness of improved fleet emission controls and best management practices over time.

EC recommended that stakeholders within the oil sands region collectively review ozone and precursor monitoring and modelling results and formulate an action plan to fill in the remaining gaps with respect to cumulative impacts.

EC noted that a long-term series of chemical measurements at spatially representative sites was needed to provide a full picture of particulate matter formation, transport, trends, and impacts. EC recommended that regional stakeholders participate in programs to initiate particulate matter and precursor monitoring. It further stated that inventories of particulate matter ($PM_{2.5}$) and associated modelling should be enhanced, including assessment of potential secondary particulate matter formation and long-range transport.

EC stated that a computer model predicted total acid deposition by simulating wet and dry deposition of relevant compounds. Wet deposition compounds were obtained directly from sampling, whereas dry deposition compounds were calculated. EC requested that the Panel include a recommendation to CEMA to design and initiate a wet and dry acid deposition monitoring program within the oil sands region. EC also recommended that all operators, including CNRL, comply with the elements of the acid deposition management framework currently being developed by the NO_x-SO_2 Management Working Group.

EC stated that preliminary acid deposition modelling indicated that long-range transport into Saskatchewan was likely causing acid deposition at levels well below the threshold for harmful effects. It stated that AENV and EC had recently undertaken additional acid deposition modelling in Alberta with a 30-year time frame so that variations in patterns and a range of deposition rates could be evaluated over time. If this new modelling indicated that deposition in Saskatchewan was more significant, monitoring in Saskatchewan might be needed and mitigative solutions considered.

Natural Resources Canada (NRCAN) concluded that CNRL had reduced the greenhouse gas intensity of its existing operations and had committed to continue efforts in that regard. It stated that CNRL was proposing to use industry standard technology to reduce emissions and that CNRL's forecast emissions were consistent with the oil sands industry as a whole. It stated that CNRL would be assessed as part of the Large Industrial Emitters Group, which was responsible for establishing and administering emission intensity targets.

17.4 Views of Alberta

AENV stated that it would be unlikely that the Canada Wide Standard (CWS) for $PM_{2.5}$ would be exceeded. However, it also stated that there was a need for monitoring to confirm CNRL's predictions. It added that it might include conditions in its approval requiring CNRL to collaborate with the Wood Buffalo Environmental Association (WBEA) on enhanced monitoring.

AENV noted that the project would increase regional SO_2 emissions by 4 per cent to 316 tonnes per calendar day (t/cd). It noted that predicted 99.9 percentile one-hour SO_2 concentrations would not exceed Alberta Ambient Air Quality Guidelines. It stated that SO_2 emissions should be controlled to the lowest practicable level, and it viewed CNRL's plan to use tail gas cleanup as consistent with AENV's requirements. It stated that it expected the plant to be designed and operated to minimize upsets that could significantly increase SO_2 emissions.

AENV stated that CNRL's project would increase regional NO_x emissions by 22 per cent to 266 t/cd. It stated that although CNRL predicted exceedance of 24-hour and annual NO_2 Alberta Ambient Air Quality Guidelines, it predicted no exceedances for communities in the area. It stated that NO_2 predictions tended to be conservative (to overpredict actual concentrations). Alberta noted that CNRL committed to using low NO_x burners and using vehicles that met or exceeded applicable emissions standards at the time of purchase. It stated that NO_x emissions should be controlled to the lowest practicable level with appropriate technology, including burners that met Canadian Council of Ministers of the Environment (CCME) low NO_x guidelines and mine equipment that met latest vehicle emissions standards. It stated that CNRL's approval might be conditioned to require it to participate in regional environmental management and monitoring initiatives.

AENV noted that the project would increase areas predicted to be impacted by acid deposition in excess of provincial monitoring loads and provincial critical loads. It stated that AENV might require CNRL to evaluate increasing the height of the main stack to increase NO_x and SO_2 dispersion.

AENV stated that it expected CNRL's plant to be designed to minimize odour incidents related to volatile organic compounds (VOCs) and other odourous gases. It stated that AENV might require CNRL to add NRU redundancy or to reduce throughput during upsets to prevent release of untreated tailings.

AENV noted that the project would increase Alberta's annual greenhouse gas emissions by 7.7 10^6 t of CO_2 equivalent. It stated that AENV might require CNRL to submit an annual greenhouse gas emissions and intensity summary report. The report would also be required to address measures taken to meet predicted performance levels and continuous improvement. It stated that it might also require CNRL to participate in future greenhouse gas emissions reporting and sectoral emissions limits or targets.

17.5 Views of the Panel

The Panel believes that new oil sands projects must minimize acidifying emissions (SO_2 and NO_x) through the implementation of effective controls and project designs. CNRL's use of tail gas cleanup technology to minimize SO_2 emissions is an example of using best practicable technology that improves upon minimum regulatory standards. The Panel notes that CNRL has designed its project for a 99.2 per cent acid gas sulphur recovery target relative to a minimum regulatory requirement of calendar quarter-year 98.5 per cent sulphur recovery, as set out in *ID 2001-3*.

The Panel expects that CNRL will achieve its 99.2 per cent sulphur recovery target on a long-term basis. Since CNRL's environmental assessment was based on that recovery level, the Panel recommends that AENV consider conditions in its EPEA approval that limit longer term (quarter-year or annual average) SO_2 emissions to levels that correspond with 99.2 per cent sulphur recovery at full calendar-day production rates.

The Panel notes that CNRL requested that its approval reflect the 98.5 per cent sulphur recovery set out in *ID 2001-3*, notwithstanding that CNRL voluntarily proposed to use emission control technology capable of performing better than minimum regulatory standards. The Panel believes that it would be appropriate to require CNRL to meet the minimum calendar quarter-year 98.5

per cent sulphur recovery, as set out in *ID 2001-3*, on the basis of acid gas produced inclusive of flared volumes, provided that long-term SO_2 emission rates are not more than those set out in CNRL's EIA.

The Panel notes that acidifying emissions from CNRL's project will contribute to the potential for acidification of soils and water bodies in the region. The panel expects CNRL to monitor acid deposition in areas potentially affected by the project, either independently or through participation in expanded regional programs. The panel notes that monitoring requirements are addressed by AENV through its EPEA approvals.

The Panel believes that the cumulative impacts associated with industrial development in the region requires new project proponents to minimize emissions, monitor environmental quality, and participate in regional initiatives. In particular, the Panel expects that CNRL will develop and sustain an effective program of operations optimization, technology assessment, and implementation of cost-effective, best-available emissions control technologies to reduce air contaminant emissions, as well as reduce the energy and greenhouse gas emissions intensity of its operations. This program must be an integral part of planning for capital equipment replacements and expansions.

The Panel further expects that CNRL will support regional monitoring programs and related monitoring improvements should these be recommended by CEMA and subsequently adopted by regulators. The Panel expects that CNRL will contribute to future acidifying emissions reductions or constraints should the need for such actions arise from industry and regulator implementation of CEMA recommendations.

The Panel believes that it would be appropriate for AENV to consider measures in its EPEA approval to address the following matters:

- CNRL collaboration with WBEA on enhanced PM monitoring
- Use of appropriate technology to control NO_x emissions to the lowest practicable level, including burners that meet CCME low NO_x guidelines and mine equipment that meets the latest vehicle emissions standards
- CNRL participation in regional environmental management and monitoring initiatives related to NO_x emissions, acid deposition, anthropogenic ozone formation, and nitrogen eutrophication, including participation in ongoing research necessary to implement CEMA recommendations on acid deposition management
- Use of appropriate systems to minimize odour incidents related to VOCs and other odourous gases, including an adequate level of NRU redundancy or other measures to prevent release of untreated tailings during upsets
- CNRL reporting on annual greenhouse gas emissions and intensity, including review of measures taken to meet predicted performance levels and reporting on continuous improvement activities
- Future CNRL participation in sectoral emission limits or targets

The Panel notes that the potential impacts of acid deposition on receptors are addressed in other sections of this decision.

The Panel believes that the project is unlikely to result in significant adverse environmental effects on air quality, provided that CNRL fully implements its proposed air emissions control measures and that performance of those systems is consistent with or better than the assumptions used in the EIA. The Panel notes, however, that the project will contribute to potential cumulative effects in the region. The Panel believes that the potential contribution of the project's air emissions to adverse cumulative effects can be adequately managed with implementation of management frameworks resulting from regional initiatives, including the CEMA NO_x-SO_2 Management Working Group and the Trace Metals and Air Contaminants Working Group (TMAC). The Panel further believes that management of potential cumulative effects will also be addressed by effective implementation of enhanced monitoring by CNRL and/or regional programs administered by RAMP and WBEA.

18 HEALTH EFFECTS

18.1 Views of CNRL

CNRL's human health assessment evaluated the potential for adverse effects to health associated with emissions from the project in combination with existing, approved, and planned developments. It evaluated exposures to chemicals in air, water, soil, and food. CNRL indicated that the assessments were based on many conservative assumptions and that its analysis had likely overpredicted potential risks to human health. Nonetheless, CNRL rated the potential effects from the existing and planned developments as negligible for all routes of exposure in local and regional communities.

CNRL confirmed that it would contribute to regional monitoring programs for substances in air, water, and traditional foods by

- participating in RAMP, which monitors water and fish, and
- participating in WBEA, which conducts ambient air monitoring in local communities and studies the uptake of airborne chemicals through the terrestrial food chain.

18.2 Views of MCFN and WBFN

MCFN stated that it had concerns for its members' health. MCFN and WBFN elders expressed concerns about an apparent long-term decline in the health of aboriginal people generally since the advent of industrialization in the region, although it was not directly associated with any particular industrial activity. Elders' observations, which tended to be supported by the Fort McMurray Medical Staff Association (FMMSA), suggest that aboriginals appear to be particularly susceptible to life-threatening diseases, such as cancer and immune system problems. At the hearing two elders reported serious worries about a large number of deaths in a short period of time in Fort McKay and Fort Chipewyan from a range of different ailments.

MCFN questioned AHW about the feasibility of conducting a baseline health study, the likely form that such a study would take, and the input that would be required from MCFN members.

18.3 Views of FMMSA

FMMSA noted significant concerns regarding health care and the high incidence of serious illness in aboriginals, including First Nations, nontreaty, and Metis individuals. FMMSA expressed a need for more information with respect to community health and requested that a comprehensive health study be conducted to evaluate if apparent problems are part of a trend.

18.4 Views of Alberta

AHW stated that an interdepartmental review team, including representation from HC, with AHW as the lead agency, reviewed the EIA using a population health risk assessment process.

AHW stated that CNRL used an acceptable methodology for its human health risk assessment, noting that the conclusions drawn from the assessment were reasonable. AHW also noted that although there were predicted air quality guideline exceedances, they were likely the result of highly conservative modelling methods. AHW suggested that validation of the predictions made by CNRL would be a logical next step in further addressing the predicted exceedances. AHW indicated that it would collaborate with AENV to determine appropriate conditions for an EPEA approval, should one be issued for the project.

AHW stated that it had strongly encouraged WBEA to include a human health monitoring component to its monitoring programs in the region that would include Fort Chipewyan. AHW suggested that this monitoring component be based on the community exposure and health effects assessment model. AHW further stated that it had made several presentations to WBEA regarding this and it was AHW's understanding that the item was currently on WBEA's agenda.

AHW stated that one form of health study could consist of an analysis of the historical health records of specific aboriginal patients, if a list of such patients were provided.

AHW stated that the health of the public would not be compromised by the construction and operation of the project.

18.5 Views of Canada

HC indicated that it was generally satisfied with the EIA and had no outstanding concerns with respect to health or social issues. HC also stated that it was an active partner in the Human Health Monitoring Committee under WBEA.

18.6 Views of the Panel

Potential effects of the project on human health are considered in the Panel's analyses for other sections of this report, particularly in the sections that relate to air and water quality. The Panel notes that AHW and HC raised no concerns with respect to the effect of the project on human health. The Panel has considered the information brought forward by CNRL and the interveners and concludes that there are unlikely to be significant adverse effects on human health.

In view of the number of concerns that were registered by interveners regarding their observations of declining health, the Panel recommends that AHW and HC consider undertaking a regional health study primarily dealing with First Nations, Metis, and other aboriginal people.

19 MEASURES TO ENHANCE BENEFICIAL ENVIRONMENTAL EFFECTS

19.1 Views of CNRL

CNRL stated that its sulphur recovery technology, the low CO_2 per unit of oil produced, the compensation lake, and the vegetation communities that would be established following reclamation were the beneficial environmental effects that would accrue as a result of the project being carried out.

19.2 Views of the Panel

With respect to CNRL's sulphur recovery technology, CO_2 production, revegetation of previously disturbed areas, and the compensation lake, the Panel views these actions as mitigative measures and not environmental benefits. The Panel expects CNRL to work closely with all stakeholders in finalizing and implementing mitigation measures to maximize any environmental benefits that may accrue as a result of the project being carried out.

20 REGIONAL INITIATIVES

20.1 Views of CNRL

CNRL stated that CEMA was an important and effective working group for dealing with the impacts of oil sands development in the region. CNRL indicated that it believed CEMA had done a substantial amount of work and would continue to be valuable in dealing with important regional issues. CNRL indicated that working through CEMA was a positive and effective method of bringing different stakeholders to the table to deal with important regional issues that may not have been otherwise identified.

CNRL stated that it had recently increased its funding of CEMA and that it was committed to continued participation in regional initiatives. CNRL noted that it would maintain its funding and participation level for both CEMA and RAMP regardless of whether the EUB conditioned it to participate or not.

CNRL stated that it participated in WBEA, a multistakeholder group with a mandate to conduct air quality and ecosystem and human health effects monitoring in the region. CNRL stated that it was committed to continue its participation in regional monitoring and assessment of air emissions in the oil sands region through WBEA.

20.2 Views of OSEC, Fort McKay, and ACFN

OSEC noted that the EUB had indicated with increasing urgency its concerns about the pace of CEMA in achieving the objectives set out in AENV's RSDS.

OSEC maintained that the continued issuance of approvals for oil sands projects in the absence of CEMA-determined management objectives and an established environmental management plan undermined the CEMA process.

OSEC stated that it was becoming increasingly apparent that the original timelines established by RSDS would not be met. It suggested that with the continued filing and consideration of oil sands project applications, CEMA members had less time to dedicate towards the work of CEMA. This was compounded by the fact that many of the experts and consultants required to conduct the work of CEMA had had limited availability due to their involvement in conducting EIAs for oil sands projects.

OSEC stated that the risk of irreversible impacts from oil sands developments was increasing. Given CEMA's difficulties in estimating timelines to collect adequate scientific information to define management objectives and the length of time needed to develop management objectives, OSEC concluded that it was inappropriate for CNRL to rely on the CEMA process to serve as mitigation for project-specific effects.

Fort McKay, OSEC, and ACFN noted that they were committed to CEMA and other regional multistakeholder initiatives, but stated that they were concerned about the lack of progress and resources to meet CEMA's goals. They believed that for CEMA to be effective, it needed a secure supply of sufficient resources, including people with appropriate expertise and funding, accountability by industry and regulators for effective participation, and strong leadership by the regulators who participated in the process. They requested that timelines be set or recommended by the Panel for CEMA to develop introductory or interim objectives for key resources: air, water quality, and water quantity.

20.3 Views of MCFN

MCFN stated that it was frustrated with CEMA's lack of progress and questioned how additional oil sands activities could be approved in the absence of many key CEMA recommendations. MCFN recommended that some interim thresholds be established prior to any further EPEA or Water Act approvals being issued.

MCFN was concerned about the inability of CEMA to meet its timelines, the lack of adequate funding, and the level and dedication of stakeholder participation in the CEMA process. MCFN's concerns were not limited to CNRL's participation, but included all members' commitment to the CEMA process.

MCFN stated that it would like the shortcomings of CEMA identified and minimum standards and policies developed to make CEMA more effective at delivering timely recommendations. In the event that the shortcomings could not be overcome in a timely fashion, MCFN would expect government to take additional control and develop alternatives to CEMA to address cumulative effects.

MCFN expressed its concern with the unequal representation of stakeholders on regional multistakeholder committees, particularly in the case of RAMP, where industry currently made up close to 50 per cent of its participants.

MCFN stated that the information provided by RAMP was difficult to use and in some cases was based on data collected using different methodologies and from different locations. MCFN expressed concern regarding the objectivity of the products produced for RAMP. MCFN noted that Golder and Associates had been the main consultant used by RAMP, and it was concerned that reports generated by RAMP predominantly cited previous Golder work, as opposed to other scientific literature.

MCFN stated that RAMP work should be peer reviewed and include people critical of the program to maximize the credibility of the final products. MCFN suggested that the work produced through RAMP should also be published in peer-reviewed journals and additional ground-truthing should be done to confirm data and validate models.

MCFN suggested that the government should manage data gathering and interpretation to ensure objectivity and quality.

20.4 Views of Canada

EC stated that it supported the CEMA initiative and would continue to participate as a stakeholder in the identification and prioritization of knowledge gaps, directing and undertaking research to fill the gaps and assessing and interpreting data and information collected through CEMA processes. EC acknowledged that the regional management objectives and activities recommended by CEMA would be reviewed and implemented by regulators.

EC noted that the pace of oil sands development may be exceeding the capacity of CEMA and RSDS to effectively develop management systems so that environmental thresholds and objectives could be established and environmental limits not be exceeded. EC, therefore, recommended the development of interim environmental thresholds and objectives by the CEMA working groups, stating that this would be consistent with applying the precautionary principle.

EC noted that CEMA did not intend to conduct long-term monitoring or carry out research beyond that needed to develop management recommendations. Therefore, the reliance of CNRL on CEMA to develop and implement monitoring programs might not be appropriate.

DFO recommended that CNRL continue to participate and abide by the recommendations and management strategies established through CEMA, RAMP, and CONRAD.

DFO stated that it understood that CNRL would monitor for effects from its project, but DFO was uncertain as to whether the actual monitoring would be done by RAMP, CNRL, or other regional monitoring groups. DFO expected that CNRL would add detail to its current monitoring plans and program to identify clearly where the data would come from (e.g., RAMP, provincial monitoring, CNRL, or any other high-quality monitoring system) to properly detect effects from the project.

20.5 Views of Alberta

AENV stated that RSDS provided a framework for balancing development with environmental protection using adaptive resource management objectives recommended by regional stakeholders. It added that the strategy supported the identification of priority regional environmental issues and the management of science and monitoring work needed to understand the issues.

AENV noted that RSDS was being implemented in partnership with CEMA, based upon the identification of priority issues and the development of recommendations for regional environmental management. It stated that recommendations brought forward by CEMA to AENV and ASRD would be considered and, if approved, implemented.

AENV noted a number of CEMA accomplishments:

- In August 2002, CEMA forwarded to regulators consensus recommendations for managing trace metals in the Regional Municipality of Wood Buffalo (RMWB), which AENV reviewed and endorsed. These recommendations included a goal, a management objective and actions, research, and monitoring activities, and an evaluation period.
- In July 2003, CEMA industry members voluntarily agreed to adopt three management tools to help minimize land disturbance related to industrial development and exploration.
- As of August 2003, CEMA had completed over 28 technical reports, with over 22 other reports in progress supporting the development of environmental management systems.

AENV stated that it might include conditions in the EPEA or Water Act approvals that required CNRL to

- participate in the activities of CEMA,
- support an ongoing research program to implement CEMA recommendations for an acidification management framework,
- support an ongoing research program to develop CEMA recommendations for developing an IFN assessment for the lower Athabasca,
- support an ongoing research program to develop CEMA recommendations for EPL, and
- submit plans demonstrating how the project could be adapted to meet future regional environmental objectives and environmental management systems.

AENV stated that CEMA's work was important to environmental management in the Athabasca oil sands and that stakeholder support for CEMA was critical to its success. AENV expected that CEMA recommendations accepted by AENV would be implemented industry-wide through industry-coordinated adaptive management activities.

20.6 Views of the Panel

The Panel notes that CNRL has identified the importance of regional initiatives to address adverse environmental effects of its project. It has also relied on monitoring, adaptive management, and reclamation activities to mitigate against these effects. In order for these mitigation measures to be successful, the Panel believes that the activities of CEMA must be strengthened and accelerated.

The Panel believes that CEMA's work is important and that the results will assist the EUB in meeting its regulatory mandate to ensure that energy developments are carried out in an orderly and efficient manner that protects the public interest. The Panel acknowledges the broad spectrum of regional environmental issues that CEMA is expected to manage as a consensus-based multistakeholder organization. CEMA's diverse membership of industry, First Nations, local aboriginal groups, regulatory agencies, nongovernmental organizations, and other stakeholders presents its own challenges respecting research, decision making, financial resourcing, and priority setting.

The Panel heard concerns relating to CEMA's funding, ability to obtain expert consultants, and ineffective participation of some CEMA members, which may have hampered CEMA work progress. In addition, the Panel heard that CEMA's recent restructuring and reprioritization would improve its ability to meet critical timelines. The Panel commends CEMA for its efforts to streamline and integrate its goals and organizational structure. Nevertheless, the Panel has concerns that CEMA's effectiveness may also be influenced by the volume and complexity of its work, multiple priorities of stakeholders, and funding mechanisms that may not keep pace with CEMA's increased workload from oil sands expansions, new oil sands mining and in situ projects, and other contributors of regional cumulative effects. The Panel also believes that greater dedication of technical experts would facilitate dealing with complex scientific issues. The Panel believes that restructuring and reprioritization are the first steps to ensuring that CEMA meets its goals and the expectations others have of it. The Panel believes it is important that RSDS expectations are clear and that CEMA's levels of funding and participation are sufficient to ensure that RSDS objectives are met.

The Panel notes that RSDS, initiated in 1999 to address environmental issues with Athabasca oil sands development, is led by AENV and ASRD and is being implemented in partnership with CEMA. RSDS initially expected to have environmental management objectives and management plans in two to five years. The Panel understands there is good support in general for CEMA but widespread concerns about delay in delivery of environmental management objectives and plans. The Panel recommends that AENV and ASRD provide stakeholders with an update on their expectations of RSDS, its deliverables, and the timing of those deliverables.

The Panel urges all CEMA participants to re-evaluate their financial support and staff resourcing allocated to CEMA and ensure that these are comparable to the amount of reliance they have put on the CEMA process to manage and mitigate the environmental effects of the project. The Panel also urges all CEMA participants to ensure that their staff are accountable for the completion of CEMA deliverables. CEMA participants may want to consider dedicating staff to this initiative. In addition, the Panel recommends that EC, DFO, AENV, and ASRD review and optimize their financial and human resourcing of CEMA to produce meaningful results in an earlier timeframe. The EUB will also examine its financial and human resourcing contribution to the CEMA process and make changes as needed.

The Panel has serious concerns about delays in the issuance of recommendations and the ability of CEMA to meet the proposed timelines. However, AENV's and DFO's statements that they would develop an IFN in the event that CEMA was not able to meet its deadlines largely addresses the Panel's concerns. The Panel also notes that AENV indicated that it would work to ensure that CEMA met its deadlines. Therefore, the Panel recommends to AENV that it develop and implement environmental management plans and objectives in the event that CEMA is unable to meet its timelines.

The Panel notes that CNRL has committed to participate in CEMA and that it would accept participation as a condition of approval. The Panel supports AENV's intention to condition CNRL's EPEA approval accordingly. It also supports DFO considering requiring CNRL to participate and support CEMA in its approval.

The Panel notes that recommendations from the IFN subgroup and the wildlife corridor subgroup are not yet available. As a result, the Panel expects CNRL to abide by the outcomes of these working groups, as well as other regional environmental management initiatives. Once CEMA or other regional initiatives have produced substantive results or AENV has set management objectives, the EUB will consider whether there is a need to review CNRL's and other oil sands approvals.

The Panel supports CNRL's commitment to participate in WBEA as an active funding member. The Panel believes that WBEA is an important component of the regional monitoring system in conducting air quality, ecosystem, and human health effects monitoring.

The Panel understands that RAMP is currently undergoing a peer review process and that recommendations will be received shortly. The Panel believes that RAMP is an important and valuable tool in regional monitoring in the oil sands region and expects that improvements to the program noted through the peer review will be implemented in a timely manner so as to maintain the effectiveness of RAMP.

The Panel understands that CNRL currently participates in and funds RAMP and expects CNRL to continue participating in this group. The Panel notes that recommendations made by the peer review process may require additional funds and expects CNRL to fully support those changes as needed to accomplish the revised mandate of RAMP.

The Panel supports DFO's recommendation that CNRL continue to participate in RAMP, CONRAD, and CEMA to address water quality issues and that CNRL implement the recommendations and management strategies established by these groups.

The Panel expects details of monitoring conditions to be determined in coordination with AENV and DFO. Conditions would be determined with the understanding that where RAMP is not providing appropriate levels of monitoring, CNRL would be expected to provide additional monitoring to ensure the completeness of the monitoring program.

21 SOCIAL AND ECONOMIC IMPACTS

21.1 Macroeconomic Impacts

21.1.1 Views of CNRL

In CNRL's view, the employment and income potential of the project suggested that it would be in the broad public interest. Of the project's estimated capital costs of $8 billion, about $3.5 billion would be spent on engineering and labour costs. Therefore, a significant number of employment opportunities would be created over the project's seven-year construction period, totalling about 20 000 person-years of employment. Long-term direct employment on the project would require approximately 2400 people per year. Both the estimates of short-term construction jobs and long-term operations jobs would be compounded by a multiplier effect.

As well, the fiscal impacts of the project would be significant. CNRL stated that the total direct revenues to governments should exceed $24 billion over the life of the project, with about $16 billion accruing to the federal government, $8 billion to the provincial government, and $700 million to RMWB.

21.1.2 Views of the Panel

The Panel accepts that the economic impacts on Canada as a result of the project would be in the order of magnitude estimated by CNRL. While the net impacts on taxes and royalties would be diminished somewhat, considering necessary public expenditures that would accompany such a large project, the Panel believes that the net benefits from taxes and royalties to Canada and Alberta would be significant. The Panel further acknowledges, as discussed elsewhere in this report, that although an increase in economic activity is generally considered to be a positive attribute of any project, certain sectors of the economy can be stressed with a substantial increase in the demand for manpower, goods, and services, particularly at the regional level.

21.2 Employment and Population

21.2.1 Views of CNRL

CNRL considered a number of potential impacts of oil sands development on the local and regional economies and on quality of life. CNRL stated that the proposed project would be one of a total of 26 different oil sands projects either operating or planned for the region, all of which add to the cumulative socioeconomic impact on Fort McMurray and the outlying communities. The project's construction workforce would peak at about 3500 people in the second half of 2006 and would exceed 2000 people for about five years over the construction time period. CNRL's permanent workforce is expected to number about 2500 people. Assuming that all of the projects planned for the region proceeded, CNRL estimated that the population increase in Fort McMurray would be significant, reaching a total population of 73 000 by the year 2010.

CNRL stated that the availability of skilled workers had become a factor in the timely completion and costs of large industrial projects. It stated that skilled workers may be in short supply in the 2006 to 2011 period and that most of its construction workers would need to be recruited from outside the Wood Buffalo region. CNRL stated that it intended to promote the use of local and regional contractors and businesses and to work with other stakeholders to maximize the potential for local involvement in the project.

With respect to employing local aboriginal people, CNRL stated it was committed to providing career opportunities for qualified aboriginal workers. CNRL also stated it would work with groups such as the Athabasca Tribal Council/Athabasca Resource Developers (ATC/ARD) and the Wood Buffalo Employment and Career Training Specialists to enhance aboriginal employment opportunities.

CNRL acknowledged that the rapid pace of oil sands expansion expected for the region could have a profound impact on First Nations, Metis, and other area aboriginal people. Although oil sands developments have increased aboriginal involvement in the industrial wage economy, this has also tended to decrease the involvement of aboriginal persons in traditional activities and has affected access to and the use of traditional lands. CNRL suggested that while some welcome the transition, others accept these changes with some misgivings. CNRL stated that it had negotiated a number of bilateral agreements with First Nations that address issues such as culture, employment, training, and business development opportunities to assist in this transition.

21.2.2 Views of MCFN

MCFN generally reflected the views as reported by CNRL in that the future of the MCFN youth must necessarily incorporate elements of formal education and involvement with the wage/industrial economy. However, again as identified in CNRL's application, MCFN was hopeful that a transition to a wage economy would not weaken the relationship of MCFN youth to their cultural identity and traditional ways of life, for this relationship had been fundamental to their cultural well-being. MCFN elders expressed the necessity of finding the proper balance between traditional ways and the demands of an industrial economy and were involved in negotiations with CNRL to attempt to come to terms with these issues. While MCFN was not opposed to industrial development in general, it thought that the project could be delayed and improved from the viewpoint of First Nations and other aboriginal people.

21.2.3 Views of WBFN

WBFN expressed similar views to those of MCFN, relating the difficulties that some aboriginal people had experienced in adjusting to a wage economy, while acknowledging the need for aboriginal youth to seek formal education and wage employment. WBFN described some of the negative aspects that tended to accompany industrial activity in rural areas, such as pollution and more intense hunting and recreational use of land as the nonaboriginal population increased.

21.2.4 Views of the Panel

The Panel recognizes that the regional social and economic impacts of oil sands developments are not always positive. The Panel believes that the CNRL project would be an important addition to the economic base of the Wood Buffalo region, generating new business opportunities and project-related construction and permanent jobs for residents, including First Nations, Metis, and other aboriginal people.

The Panel believes that CNRL's commitment to enhancing opportunities for training and access to project employment should ensure that those who want to participate in this type of work would have a reasonable opportunity of doing so. However, the Panel also appreciates that such participation may involve difficult decisions for some First Nations, Metis, and other aboriginal people, as participating in the market economy may mean less attention is paid to traditional culture and activities.

The Panel supports the cooperative ways that CNRL and the First Nations are working towards mutually satisfactory arrangements in many areas.

21.3 Public Infrastructure/Services

21.3.1 Views of CNRL

CNRL indicated that its project, along with others that are occurring or are planned, would contribute to a number of social and economic impacts in the RMWB. The impacts identified by CNRL related to housing, roads and traffic, emergency services, policing, hospital and medical services, education, social services, and municipal services and infrastructure.

CNRL noted that many of these impacts were not new and were associated with previous oil sands development activity in the region. CNRL recognized that its project would be part of the cumulative impacts of the industrial development and population changes that were taking place. CNRL noted that it had been working closely with the RMWB, Northern Lights Regional Health Services (NLRHS), various multistakeholder groups, First Nations, other resource developers, and provincial and federal government departments to understand and find solutions to many of the existing and evolving socioeconomic issues. CNRL also made direct financial contributions in some areas to alleviate certain strains, including the development of lower income housing in Fort McMurray, funding First Nations cultural activities, and providing funds to the ATC/ARD development agreement.

CNRL committed to a number of initiatives at its plant site during construction and operations in order to reduce a number of impacts on both Fort McKay and Fort McMurray. These included the development of a well-serviced medical clinic on site, control of road traffic near Fort McKay, using buses along with reduced and staggered traffic flows to the site, use of a fly-in program for workers, strong alcohol and drug use policies, and participating in a health study involving First Nations, Metis, and other aboriginal people.

CNRL also committed to being actively involved in the future in working on solutions to the various RMWB socioeconomic issues by actively participating in multistakeholder groups, such as RIWG and the Alberta Oil Sands Developer Committee, and to work with the RMWB and the relevant provincial government departments. However, CNRL also indicated that many socioeconomic issues were outside the normal scope of activities of individual private oil sands companies and involved provincial and federal responsibilities. Company-specific impacts were increasingly difficult to separate from cumulative effects.

21.3.2 Views of FMMSA

FMMSA did not take a position with respect to future oil sands development in Wood Buffalo. However, it expressed an urgent need for improvements in health care funding for the region. FMMSA noted that the current available resources were not sufficient to provide fair and equitable medical care access for the current population of the municipality and the numbers of workers at the existing and approved oil sands expansions. FMMSA noted that

- the number of hospital beds in Wood Buffalo was roughly only two-thirds of the provincial average;
- the ratio of doctors to population was about less than half the provincial average and less than 40 per cent of the national average; and
- The range of services offered by the NLRHS was limited by financial resources, resulting in, for example, the lack of an orthopaedic surgeon.

FMMSA also expressed an urgent need for improvements for rapid response emergency services with respect to both Fort McMurray and Edmonton. It stated that there had been avoidable deaths due to a lack of adequate services.

FMMSA identified the regional health authority's funding model as the main contributing factor to the deficient level of health services in the region, stating that it had not provided an adequate level of services for the existing population, nor did it adequately account for the future requirements of significant imminent population increases. FMMSA requested that the Panel create a credible regulatory oversight committee to set standards and monitor minimal standards of fair and equitable access to health care in the Wood Buffalo region.

21.3.3 Views of OSEC

OSEC generally supported CNRL's evidence regarding the current shortage of many types of services, including health care provision, affordable housing, road improvements, sewage, waste disposal, water treatment, and education. OSEC stated that the prospect of a rapid expansion of oil sands activity in the region necessitated an expansion of all of these services in the near future. Further, OSEC noted that these same concerns had been identified in previous socioeconomic impact assessments (SEIAs) but there had been few successful or innovative approaches to dealing with them.

OSEC identified RIWG as the organization chosen by industry and relied upon by the government thus far to monitor, research, and coordinate responses to cumulative social effects of development. OSEC stated, however, that RIWG's membership was made up almost entirely of industry and government members. One effect of this appeared to be a focus on the needs of the oil sands industry and its employees, as opposed to the community as a whole. It stated that nonmembers could only attend RIWG meetings by invitation in a nonvoting capacity, thereby limiting their ability to effectively participate in the mitigation, monitoring, and management of the social effects of oil sands developments. OSEC stated that CNRL agreed that a multistakeholder consensus-based committee was needed to address community-based socioeconomic issues resulting from industrial growth in the region. In OSEC's view, a group such as this would bring a greater breadth of understanding of the issues and would be more effective in designing and implementing effective and comprehensive solutions that meet community needs.

21.3.4 Views of the Panel

With respect to socioeconomic impacts and the provision of public services, the Panel acknowledges, along with CNRL and the interveners, that the project is likely to compound shortages that were identified in some sectors in the Wood Buffalo region. As well, the Panel agrees with the general sentiment expressed by CNRL and the interveners that better communication among all the stakeholders, adequate planning and monitoring for future requirements, and additional investment where appropriate would help to minimize the stress on many public services.

Similar concerns regarding the current level and future direction of public services have been expressed in previous EUB proceedings on major energy facilities in the Wood Buffalo region. Previously, the Board has expressed the view that the responsible government agencies are aware of the concerns and that they are responding to them. The Panel expects that this is still the case. However, given that the same concerns continue to be expressed, by CNRL in its SEIA and by the interveners, the Panel believes that there may be insufficient communication from the relevant government departments and the many multistakeholder committees to the Panel, to First Nations and to the public. Whether it is ultimately a matter of more effective communication, more open consideration of socioeconomic and health impacts, or a re-evaluation of the adequacy of some existing public services, it appears to the Panel that neither CNRL nor the interveners are satisfied that the level of public services in the Wood Buffalo region is able to meet some of the current and future needs for area residents and newcomers.

While the Panel does recognize that governments and regional multistakeholder committees are tackling regional socioeconomic issues, it believes better coordination and communication could further enhance these efforts. Some of the interveners suggested that a new consensus-based multistakeholder committee was needed to address socioeconomic issues. The Panel agrees in principle that the process for addressing socioeconomic issues should involve all affected stakeholders, but it does not take a position on how this can best be accomplished (whether through a new committee or accommodated within the existing committees). The Panel recommends that governments and other stakeholders review these matters and provide a strong focus of attention for them.

21.4 Impact on the Dastous

21.4.1 Views of CNRL

CNRL identified the Dastous as a couple having a trapline adjacent to and partially within CNRL's lease boundaries. They had constructed a permanent residence close to the Athabasca River approximately 300 m north of CNRL's lease boundary.

CNRL stated that it had compensated the Dastous several times for the impacts it had had on their well-being and would continue to compensate them for damages caused to, or impacts on their well-being. CNRL noted that it did not yet have regulatory approval for the proposed project and therefore was unable to make a long-term commitment to the Dastous for what might happen 10 or 15 years in the future.

21.4.2 Views of the Dastous

Mr. and Mrs. Dastous stated that they built their permanent residence themselves and that it was to be their retirement home. Mrs. Dastous stated that the Fish and Wildlife Division office in St. Paul advised her that a trapper did not require a permit to build a cabin on his or her registered trapline and that there were no restrictions on the number or size of cabins a trapper could build. Mrs. Dastous also stated that the "Forestry" office in Fort McMurray advised her that only one cabin could be constructed and that it could not be larger than 24 feet by 24 feet or less than 1000 feet from the Athabasca River. Mr. Dastous stated that prior to completing construction, they sought and were given verbal permission to build the home. That evidence was not challenged in the hearing. Following the oral hearing, the Dastous provided the Panel with copies of the written permits for the trapline.

Mr. and Mrs. Dastous stated that CNRL had compensated them for losses resulting from CNRL's activities that affected the trapline, although they expressed some frustration because one of the compensation payments was offered on a "take-it-or-leave-it" basis. They also indicated that they had used the trapline as part of an ecotourism business, but after hosting about a dozen patrons they did not continue pursuing that business. Mr. and Mrs. Dastous had come to the area in 1985, and while they were aware of oil sands development in the general area, they did not anticipate that oil sands activity would come as close to their home as the proposed project would within its time frame.

Mr. and Mrs. Dastous were concerned over the loss of the lifestyle they currently enjoyed and expected to enjoy in the future in their retirement home. They stated that commencement of land clearing activities would be a sufficient impact on their lifestyle to cause them to leave the area. They indicated that they had already been affected by the operation of heavy equipment and by road cutting in the area. Most of all, they were concerned that CNRL did not appear to have immediate intentions to address their expected loss of lifestyle. They produced a letter from CNRL that indicated they would not be impacted for 15 or 20 years. They responded that they had already been affected by CNRL and that if the project proceeded, they would leave the area. Mr. and Mrs. Dastous asked the Panel to impose as a condition of approval that CNRL be required to reach an agreement to compensate them for the loss of their lifestyle.

21.4.3 Views of the Panel

The Panel notes that Mr. and Mrs. Dastous were the only witnesses to give evidence on the question of what approvals were necessary in order for them to construct a permanent residence in proximity to the project lease. The Panel also notes that the Dastous themselves were not certain exactly what approvals were required and from whom. The Panel further notes that the copies of the permits Mr. and Mrs. Dastous provided do not address the matter of a home being built on or near the trapline. Based on the evidence before the Panel, the only conclusions it can make are that Mr. and Mrs. Dastous received verbal approval to construct their home or that no approval was needed and there are no requirements or restrictions that the Dastous had to observe when building the home.

Without commenting directly on the Dastous' situation, the Panel is concerned that anyone would be permitted to build a permanent residence within or near an area leased for oil sands mining operation. Such conflicting uses would inevitably result in the difficulties and disappointment expressed by Mr. and Mrs. Dastous. It is not clear to the Panel what authorities, if any, have the jurisdiction to control or prohibit construction of a permanent residence in or near an area leased for oil sands mining operations. If such construction is regulated, the Panel strongly suggests that the authorities having jurisdiction over the matter reconsider allowing any permanent residence to be constructed within or in close proximity to an area leased for oil sands operations. The Panel also suggests that land users who are considering building in or near an area that may possibly become a site for oil sands operations carefully consider whether they are prepared to live in close proximity to such development.

CNRL acknowledges that Mr. and Mrs. Dastous' trapline has been affected by past activities, and it has compensated them for those effects. The Panel is encouraged that to date compensation relating to the trapline itself has been a matter the parties have resolved between themselves. The Panel notes that jurisdiction over the matter of trappers' compensation rests with the Trapper Compensation Board, and if necessary the parties have recourse to that board to resolve any dispute over compensation for impacts to the Dastous' trapline.

CNRL also stated that it would compensate Mr. and Mrs. Dastous for any future disturbance, damage, or impact that affects their well-being. Impacts on and the loss of lifestyle are Mr. and Mrs. Dastous' primary concern about the proposed project. It is apparent to the Panel that the uncertainty over when compensation discussions will take place is causing Mr. and Mrs. Dastous significant concern. This concern was not alleviated when CNRL provided a letter stating that in its view Mr. and Mrs. Dastous would not be impacted for 15 to 20 years and that CNRL would be prepared to initiate compensation discussions after regulatory approval was given. Mr. and Mrs. Dastous stated they have already been impacted by the proposed project and that future impacts, commencing with land clearing, will be sufficient to cause them to leave the area. For that reason, they are anxious to have the matter of compensation for their loss of lifestyle addressed by CNRL at an early date.

Assuming that the project proceeds, the Panel is of the view that Mr. and Mrs. Dastous' current lifestyle will be significantly affected some time prior to the day mine operations reach the northeastern limit of the proposed mine, being the point closest to the Dastous' permanent residence. CNRL estimated that it would be impacting the Dastous in 10 to 15 years. Mr. and Mrs. Dastous stated they will be impacted when land clearing commences. The Panel is not able to state with certainty at what point in time or development CNRL's proposed project will impact Mr. and Mrs. Dastous to the extent that their loss of lifestyle is significant. The Panel also notes that it has no jurisdiction on the issue of compensation for a party's loss of land or loss of use or enjoyment of land. However, the Panel expects CNRL to recognize the Dastous' desire to have the matter of compensation for their loss of lifestyle addressed at an early date. In its correspondence to Mr. and Mrs. Dastous, CNRL indicated that it would be prepared to discuss compensation matters once regulatory approval was given. The Panel expects CNRL to fulfill that representation and to begin consultations with Mr. and Mrs. Dastous without delay if and when approvals are issued. The Panel will not impose a condition requiring CNRL to reach an agreement with Mr. and Mrs. Dastous, but it expects both parties to consult in good faith with the common goal of reaching a mutually satisfactory compensation plan.

22 PUBLIC CONSULTATION

22.1 Views of CNRL

CNRL expressed concern that the consultation issues advanced by MCFN were not brought forward until the closing argument stage of the hearing. CNRL also asserted that MCFN's claim that insufficient consultation had occurred was inconsistent with the prehearing submissions and evidence of MCFN, which focused on concerns about gaps it had identified in the EIA. CNRL stated that it was also inconsistent with the sophistication of MCFN, as evidenced by its business holdings, and the fact that CNRL had provided funding to MCFN in excess of $155 000 so that MCFN could retain experts to review the EIA.

In response to MCFN's position that its members' rights under Treaty 8 could not be affected by the project before adequate government consultation had taken place, CNRL stated that the rights conferred in Treaty 8 were neither exclusive nor in all circumstances perpetual and that the wording of Treaty 8 left open the question of whether treaty rights would continue to extend to the area of the proposed project mine.

In response to MCFN's position that it was a holder of a licence or lease as those terms are used in Section 23 of the Fisheries Act, CNRL stated that as a matter of statutory interpretation it was abundantly clear that MCFN members were not holders of a license or lease as contemplated by that section of the statute. CNRL stated that the licence or lease referred to in Section 23 of the act was a licence or lease granted by the minister under the act.

Further, on the matter of consultation, CNRL indicated that it was not clear whether MCFN was raising the consultation issue in relation to Section 35 of the Constitution Act, 1982, whether it was arguing consultation in relation to the public interest question, or whether it was arguing consultation in relation to the terms of reference for the EIA. CNRL stated that it agreed with Alberta that the Panel did not have authority to deal with the constitutional consultation question, nor was it appropriate for the Panel to attempt to address that issue. With respect to consultation other than the constitutional question, CNRL stated that the Panel had more than adequate evidence that sufficient consultation had occurred to satisfy the public interest question and the consultation requirements arising under the terms of reference.

CNRL stated that it was prepared to continue into negotiations with MCFN in order to resolve their outstanding concerns as it had done with other First Nations groups. However, CNRL indicated that it was unable to negotiate while the hearing was under way. It stated that it was prepared to continue discussions and negotiations following the hearing.

CNRL stated that it had met with elders and other community residents in Fort Chipewyan a number of times in relation to the project and had made project design changes as a result of those meetings. It had also had discussions with WBFN, and CNRL indicated that it was prepared to have further discussions. CNRL stated that on June 13, 2003, it and other oil sands developers had signed a Metis industry consultation agreement with six RMWB Metis locals.

22.2 Views of MCFN

MCFN stated that it had not been consulted separate and apart from the public consultation process and because of this MCFN was not in a position to say whether the proposed project would impact its members' rights as little as possible. MCFN did acknowledge that some level of consultation had occurred between it and CNRL, but stated that the environmental and social issues arising from the project had not yet been adequately addressed. MCFN stated that any approvals or rights required by CNRL for the project would be subordinate to the constitutionally guaranteed treaty rights of MCFN. To the extent that the governments and CNRL had failed to fulfill their respective obligations to consult with MCFN, the approvals and rights acquired by CNRL would not supplant MCFN's rights to occupy traditional lands and carry out traditional practices thereon.

MCFN also stated that the Panel agreement and CEAA provided the Panel with authority to decide whether Canada and Alberta had satisfied the obligation imposed on each of them by Section 35 of the Constitution Act, 1982, to consult with MCFN in relation to the project. MCFN stated that such consultation had to occur separate and apart from the public consultation that normally took place as part of the regulatory process and there was no evidence that it had taken place in the course of these applications.

During closing argument, MCFN stated that it was not asking the Panel to make a finding that a legislative provision conflicted with Section 35 of the Constitution Act. MCFN stated that it was asking the Panel to confirm that MCFN's treaty rights existed in preference to any licence or approval that may be issued by government. In also asked the Panel to rule on whether Alberta and Canada had carried out their consultation obligations under the Canada-Alberta Agreement for Environmental Assessment Cooperation. MCFN stated that the Panel had to determine whether the project was in the public interest and that the absence of adequate, meaningful consultation between CNRL and MCFN or the regulators and MCFN required the Panel to assume that the public interest test under EUB legislation had not been met.

During the hearing, MCFN stated that it was prepared to negotiate an agreement with CNRL to resolve its concerns.

22.3 Views of the Dastous

To the extent the matters raised by Mr. and Mrs. Dastous included concerns about consultation, their and the Panel's views are contained in Section 21.4 of this report.

22.4 Views of WBFN

WBFN stated that it did not oppose development as such but opposed haphazard development. It stated that it was a First Nation and was entitled to be consulted in the same manner as other First Nations. WBFN stated that its goal was to be consulted in a meaningful manner by oil sands developers and by CNRL. WBFN stated that meaningful consultation meant WBFN participating in the consultation process without incurring a financial cost to do so. Consultation also meant identifying issues working with parties, and coming to agreement on those issues, even if that meant some amount of compromise. With respect to consultation with CNRL regarding the proposed project, Mr. Malcolm stated that when he asked CNRL to provide him with the application materials, he was provided instead with a CD-ROM version that he could not read because he had no computer and CNRL refused to supply him with one.

22.5 Views of Canada

Canada stated that MCFN did not distinguish between consultation as it related to CEAA or the Panel agreement and consultation as it related to Section 35 of the Constitution Act, 1982. Canada stated that the obligation of a federal authority to undertake constitutional consultation arose when it took actions that directly affected First Nations. In the case of the applications for the project approvals, the consultation process had not ended and DFO, as the responsible authority, would be considering whether sufficient consultation had taken place prior to issuing any type of authorization.

Canada also stated that Indian and Northern Affairs Canada did not recognize WBFN as a band under the Indian Act.

22.6 Views of Alberta

Alberta, as represented by the Minister of Justice for Alberta and the Attorney-General for Alberta, stated that the Panel should not consider the constitutional consultation issues raised by MCFN. Alberta stated there were three bases for that, the first of which was an absence of proper notice of the issue. Alberta stated that notice of intention to raise the issue was required not only as a matter of procedural fairness, but also as a specific requirement under Section 24 of the Judicature Act. Alberta stated that such notice had not been provided in this case.

Second, Alberta stated that the Panel had no authority to determine constitutional issues. Alberta stated that the powers conferred on the Panel by the provincial and federal statutes governing the proceedings and the application did not include the power to determine questions of law or constitutional issues. Given the absence of that power, the Panel was not entitled to determine whether the proposed project would infringe upon rights arising under Section 35 of the Constitution Act, 1982, or whether such infringement could be justified.

Alberta also stated that if the Panel decided it did have jurisdiction to consider the constitutional consultation issues, in Alberta's view the Panel should decline that jurisdiction in favour of the Courts, which are much better suited to deal with the complicated and timely process of deciding constitutional questions.

22.7 Views of the Panel

The Panel notes that CNRL undertook an extensive consultation process in relation to the proposed project and the Panel commends CNRL for its efforts. This is clear from the evidence provided by CNRL, in particular its detailed List of Stakeholder Consultation, and by other parties' witnesses. The Panel notes the agreements made between CNRL and Fort McKay and between CNRL and ACFN, and it commends the parties for achieving those agreements. The Panel also notes the technical review that was undertaken by MCFN, which in the Panel's view demonstrates a comprehensive understanding of the proposed project.

CNRL stated that it had consulted with WBFN and that it was prepared to have further meetings with WBFN to discuss the project. WBFN's consultation efforts appear to have stalled when it was provided with a CD-ROM version of the application but not with a computer. The Panel notes that the application materials were available for public viewing at the EUB office in Fort McMurray and notice of this was provided in the Notice of Joint Panel Agreement. The Panel believes that all affected parties have an obligation to participate in the consultation process, and this requires them to each make a reasonable effort to engage the process.

The Panel is of the view that the consultation requirements applicable to the EUB application before the Panel have been met by CNRL and, therefore, the Panel is not prepared to condition or delay issuing EUB approvals on the basis of inadequate consultation.

MCFN addressed the question of consultation with First Nations. The Panel agrees with Canada and Alberta that the consultation issue was not raised prior to the hearing to the same extent that MCFN argued the issue at the closing of the hearing. MCFN's prehearing submissions focused on its gap analysis of the EIA.

WBFN did not make a prehearing submission, but during the hearing it stated that it wished to be consulted in a meaningful manner by CNRL. During its closing argument, WBFN stated that the hearing being conducted by the Panel was not the proper forum in which to determine WBFN's constitutional consultation issues, but that it wanted the Panel to take note of WBFN's position on that matter.

With respect to the request by MCFN that the Panel confirm that MCFN's treaty rights exist in preference to any licence or approval that may be issued by government, the Panel is not prepared to make that confirmation, nor is it satisfied that such confirmation by the Panel is needed to preserve whatever MCFN treaty rights may be affected by future government action. The Panel notes that Canada stated that the consultation process had not ended and that DFO would be reviewing the matter of consultation prior to issuing any type of authorization.

The Panel is also of the view that it does not have sufficient evidence on the constitutional question to allow it to make a recommendation on that issue. Little or no evidence was provided to indicate what, if any, specific treaty rights would be affected if the project were to proceed, and no evidence was provided that would enable the Panel to decide whether an infringement of treaty rights would occur, and if so whether it could be justified in this case.

With respect to MCFN's position regarding Section 23 of the Fisheries Act, the Panel is not prepared to make the recommendation requested by MCFN.

During closing argument, counsel for MCFN cited Clause 12 of the Canada-Alberta Agreement for Environmental Assessment Cooperation, which is referred to in the recitals to the Panel agreement. In the Panel's view, the consultation requirements under Clause 12 of the Environmental Assessment Cooperation Agreement are that potentially affected aboriginal people must be notified of the project and be given the opportunity to provide input on the terms of the EIA, to comment on the EIA itself, and to appear at a public hearing if one is convened. MCFN's witnesses confirmed that MCFN was notified of the proposed project and was given an opportunity to comment on the terms of reference for the EIA. MCFN made prehearing submissions on the EIA and participated fully in the hearing. The Panel is of the view that MCFN was afforded all the consultation opportunities referred to in Clause 12 of the Canada-Alberta Agreement for Environmental Assessment Cooperation.

23 CAPACITY OF RENEWABLE RESOURCES

23.1 Views of CNRL

CNRL assessed the potential for its project to have an adverse environmental effect on the capacity of renewable resources, such as fishing, forestry, trapping, berry picking, hunting, outdoor recreation, and tourism. Because the project would be located in an area where other resource uses occurred, CNRL conducted an assessment to identify the potential effects of the project on other resource use. CNRL indicated that site clearing for the mine site, plant site, tailings pond, dumps, and infrastructure corridors for the project may reduce resource availability, while the construction of roads could increase access to resources. CNRL determined that an increase in the local workforce could increase competition for resources.

CNRL's assessment involved identifying and comparing possible interactions between resource uses and its proposed development. It identified issues to develop key questions and linkages that detailed potential impacts of the project on resource use. It developed and then assessed linkages between project activities and environmental changes that affected each of the key questions.

CNRL evaluated the project's construction and operation activities, as well as social changes, such as an increased regional population, to determine potential impacts. Following this, CNRL developed mitigation strategies for each valid linkage. It assessed residual impacts with regard to direction, magnitude, geographic extent, duration, frequency, and reversibility.

CNRL considered the accessibility of each of the renewable resources, changes to the resources due to clearing and development, and population pressure on each resource. For each type of resource use, it identified relevant government guidelines, available resource use statistics, and important locations in which resources were located in the RSA and LSA. It investigated three cases: an existing/approved case, a project development case, and a planned case.

CNRL indicated that the existing/approved case included an assessment of the cumulative effects from existing and approved developments within the defined study areas, including communities.

CNRL's project development case included the existing/approved case developments in combination with the potential effects of the project. This scenario represented the cumulative effects should the project become operational. Since the project, as well as several of the approved developments, had not yet been constructed, it would be several years before predicted environmental impacts reached the levels used for the project development case.

CNRL's planned case included all of the existing and approved projects in the region, the project, and other planned regional developments. The planned case included planned projects publicly disclosed at least six months prior to the submission of the project EIA, none of which had received approval to operate and many of which had yet to apply for approval. The environmental impacts used in the planned case represented speculative levels. The assessed impacts could be greater than those realistically attained in the future.

Increases in the region's population under both the project development case and the planned case would have implications for all types of resources in the RSA. Effects would include increased demand for fishing, hunting, berry picking, and recreation. For Fort McMurray, CNRL estimated a population increase of 21 per cent over the existing/approved case under the project development case and a population increase of 62.5 per cent over the existing/approved case for the planned case. CNRL stated that it expected that both changes would cause increases in demand for resources.

Impacts on environmentally important areas and resource use of all types would be mitigated under NNLPs (i.e., for fisheries), during reclamation (i.e., for forestry, berry picking, and hunting locations) and minimization of the area to be cleared (especially in environmentally important areas). Exploring for new resource sources, such as aggregate deposits, or building new venues for nonconsumptive resource use, such as recreation, could also represent effective mitigation options.

CNRL determined that agricultural activity would not be affected under the project development case or the planned case because there was no agricultural activity occurring within the LSA.

CNRL identified that forestry was a relatively important extractive industry in the RSA and some forestry companies had been negatively affected by previous oil sands developments. Effects on forestry as a result of the project would occur due to clearing of forests in the LSA. CNRL analyzed this issue by assessing the effects of the project on merchantable timber. Trees would be lost from the development footprint for the life of the project. Following closure, the productive forest stands would be restored through reclamation. CNRL considered that the effects on forestry resulting from the project under the project development case would be negligible. In the current five-year plan, compensation for lost timber allocations was being provided, and the loss of forested lands was reversible. CNRL indicated that long-term effects could be mitigated by reclamation of development areas, with a return of equivalent or greater capability for forestry.

CNRL indicated that potential berry harvesting areas would be affected by site clearing activities. It assessed berry picking by analyzing the impacts to the berry producing plants. Approximately 8100 ha (56 per cent) of potential berry picking habitat in the LSA would be affected by the project. More than 99 per cent of this area would be restored to potential berry picking habitat following closure. Effects on berry picking could also occur due to changes in access to the south of the project. The effects of improvements in access in this area would be positive wherever a new access route traversed potential berry picking habitat. CNRL determined that the LSA was rarely used for berry picking in practice. As a result, CNRL concluded that the effects on berry harvesting would be negligible.

CNRL indicated that hunting and trapping did occur in the LSA and would be negatively affected by the project. The project would result in a temporary loss of wildlife habitat during and in some cases past the life of the project. Hunting in the LSA by nonaboriginal people had historically been very limited, although recent access improvements could have encouraged a short-term increase in hunting activity. As a result, CNRL concluded that the effects on hunting and trapping would be negligible.

CNRL concluded that the project would result in a temporary loss of furbearer habitat during and in some cases extending several years past the life of the project. This localized habitat loss would have the potential to affect some trappers in the region. The overall environmental consequence to trapping was negligible. However, consequences could be greater for the trappers directly affected.

CNRL stated that fishing was an important recreational activity in the RSA and that two sport fish-bearing watercourses, the Tar and Calumet Rivers, would be diverted as part of the project. However, it noted that relatively small numbers of anglers used these watercourses for fishing, as there had historically been a lack of access to the area. CNRL stated that these fishing areas would be replaced with equivalent or better habitat, including the new Horizon Lake, which would be accessible to the public. The project would result in a loss of some potential fishing areas in the LSA (most important, segments of the Tar and Calumet Rivers). However, implementation of an approved No Net Loss Fisheries Habitat Plan would ensure that there was ultimately no net loss in fish habitat, and habitat for some sport fish species could improve. CNRL concluded that the overall environmental consequence to fishing would be low.

23.2 Views of the Panel

The Panel is of the view that for each renewable resource that could be affected, CNRL has proposed adequate mitigation. The Panel believes that given the nature of the project and the mitigation measures that will be implemented, the project is not likely to cause significant adverse environmental effects on renewable resources. Accordingly, the Panel concludes that the capacity of those resources to meet the needs of the present and those of the future is not likely to be significantly affected.

24 TRADITIONAL USE AND CULTURAL RESOURCES

24.1 Views of CNRL

CNRL stated that important historic resources within the project area would be subject to permanent impacts. CNRL proposed that its mitigative measures would include resource avoidance and information recovery. CNRL undertook a Historical Resources Impact Assessment (HRIA) in consultation with Alberta Community Development (ACD). The assessment included interviews and mapping studies with affected stakeholders to identify historical resource sites and areas of cultural concern.

Several sites were identified within the proposed project area, including camps, hunting blinds, cabins, and trails. CNRL proposed that effective mitigation strategies would be established that would result in negligible negative effects on historical resources.

CNRL evaluated the potential impacts to traditional land use based on an understanding of how aboriginal peoples had been using the land and resources within the area. CNRL indicated that traditional land-use patterns would continue to be affected by a wide variety of regional developments, including oil sands projects and their associated infrastructure, forestry operations, commercial developments, government projects, and municipal expansions. CNRL stated that these effects would result from landscape disturbance and ecological disruption, as well as from restrictions that would be placed on access to areas containing industrial facilities. Local and regional development would also indirectly affect existing traditional land-use patterns as a result of increased noise, traffic, dust, and increased access for competing resource use. CNRL stated that these effects were likely to have a wide variety of social and cultural consequences, most of which would negatively affect traditional land use.

CNRL stated that it was committed to successful implementation of a comprehensive series of mitigative strategies to offset the effects of the project on traditional land use. These strategies included access control, consultation with directly affected trappers, and a reclamation plan that would restore traditional land-use opportunities as soon as possible.

24.2 Views of the Panel

The Panel accepts CNRL's evidence and notes that interveners did not raise any objections to CNRL's methodology, proposed mitigation measures, and conclusions. With appropriate and effective mitigation strategies, the Panel believes there would be no significant adverse environmental effects on historical and cultural resources.

With respect to the effects of the project on traditional uses, previous sections of this report discuss the general effect the project would have on lands and resources. The Panel notes that CNRL has committed to ongoing consultation with trappers and aboriginal users in the project area. The Panel concludes that there is unlikely to be significant adverse effects to the resources and lands used for traditional purposes, provided that the mitigation measures proposed by

CNRL are implemented. The Panel expects CNRL to keep its commitments as negotiated with First Nations, Metis, and other aboriginal people.

Dated in Calgary, Alberta, on January 27, 2004.

ALBERTA ENERGY AND UTILITIES BOARD
CANADIAN ENVIRONMENTAL ASSESSMENT AGENCY

J. D. Dilay, P.Eng.
Presiding Member

R. Houlihan

R. Houlihan, Ph.D., P.Eng.
Panel Member

George Kupfer

G. Kupfer, Ph.D.
Panel Member

APPENDIX 1 SUMMARY OF APPROVAL CONDITIONS AND COMMITMENTS

APPROVAL CONDITIONS

CNRL must do the following as conditions of approval:

On or before December 31, 2007, submit to the EUB for its review and approval a report on the southwest area lease boundary containing a comprehensive evaluation of the lease boundary geology and reserves, geotechnical conditions, alternative mining scenarios and impacts, and associated costs, in accordance with Section 3.1 of EUB *ID 2001-7* (Section 7.1.3).

At least five years prior to mining at the southeast lease boundary but no later than December 31, 2010, submit to the EUB for its review and approval a report on the southeast area lease boundary containing a comprehensive evaluation of the lease boundary geology and reserves, geotechnical conditions, alternative mining scenarios and impacts, and associated costs, in accordance with Section 3.1 of *ID 2001-7* (Section 7.1.3).

At least six months prior to the construction of the plant site, submit to the EUB for its review and approval a report documenting efforts that have been taken to optimize the plant site area with respect to the minimization of resource sterilization (Section 7.2.2).

At least six months prior to field preparation, submit to the EUB for its review and approval detailed geotechnical designs for all external overburden disposal areas (Section 7.3.2).

At least five years prior to mining at the final pit wall but no later than December 31, 2016, submit to the EUB for its review and approval a report evaluating the mineable oil sands ore quality and nonrecoverable quantity in the east final pit wall area adjacent to the Athabasca River, and a detailed geotechnical stability evaluation of the final east pit wall location (Section 7.5.2).

Beginning with the September 2004 annual mine plan, submit to the EUB the details of the MOPP testing (Section 7.6.2).

At least six months prior to beginning mine depressurization activities, submit to the EUB for its review and approval a monitoring plan to detect basal aquifer pressure changes at the lease boundary with DCEL (Section 7.7.3).

On or before February 28 of each year following start-up of mine depressurization activities, or such other date as the EUB may stipulate, submit to the EUB a report on the results of the basal aquifer monitoring program at the lease boundary with DCEL (Section 7.7.3).

Within one year of project approval, satisfy the EUB on the need, or otherwise, to monitor the effects of depressurization and injection activities along the northern and western boundary of mining activities (Section 7.7.3).

On an annual average basis, limit diluent losses to tailings and the scheme to not more than 4.0 volumes per 1000 volumes of bitumen production, unless it can satisfy the Board that a limit of 4.3 volumes per 1000 volumes of bitumen production is appropriate (Section 8.2.3).

Not discharge any untreated froth treatment tailings to the tailings area (Section 8.2.3).

Every five years commencing February 28, 2010, or such other date as the EUB may stipulate, submit to the EUB a report on the feasibility of coke use and sales potential (Section 9.13).

On or before February 28, 2005, and every year thereafter, or such other date as the EUB may stipulate, submit to the EUB a progress report summarizing

- research and development on solid tailings technologies, and
- modifications to the existing tailings plan to ensure a trafficable landscape, rapid progressive reclamation and to eliminate the need for long-term storage of fluid tailings (Section 10.1.3).

Two years prior to planned start-up, or such other date as the EUB may stipulate, submit to the EUB a report summarizing the engineering design and operating plans for the NST system (Section 10.1.3).

On or before February 28 of every year following start-up, or such other date or frequency as the EUB may stipulate, submit to the EUB a report summarizing for the preceding year the performance of the NST system, including reasons for deviations from design (Section 10.1.3).

Within one year of project approval, satisfy the EUB on the need, or otherwise, to monitor for potential effects of injection activities on the depressurization needs of other developments in the regional study area (Section 12.7).

Include in the project area a minimum setback of 250 m from the edge of the wetted width of the Athabasca River during spring flow, excluding the water intake facility (Section 15.6).

Commitments

The Panel notes throughout the decision report that CNRL has undertaken to conduct certain activities in connection with its operations that are not strictly required by the EUB's regulations or guidelines. These undertakings are described as commitments.

It is the Panel's view that when a company makes commitments of this nature, it has satisfied itself that these activities will benefit both the project and the public, and the Panel takes these commitments into account when arriving at its decision. The Panel expects the applicant, having made the commitments, to fully carry out the undertaking to the extent that those commitments do not conflict with the terms of any approval or licence affecting the project or any law, regulation, or similar requirement CNRL is bound to observe, or to advise the EUB if, for whatever reasons, it cannot do so. The EUB would then assess whether the circumstances regarding the failed commitment warrant a review of the original approval. The Panel also notes that the affected parties also have the right to request a review of the original approval if commitments made by the applicant remain unfulfilled.

In addition to commitments made at the hearing, CNRL filed three documents listing in detail its commitments to stakeholders and regulators in the areas of operational management, environmental management, socioeconomic initiatives, and consultation. These documents are a matter of public record and were filed as exhibits 9, 22, and 48.

APPENDIX 2 PANEL AGREEMENT

AGREEMENT

To Establish a Joint Review Panel
for the Horizon Oil Sands Project

Between

The Minister of the Environment, Canada

- and -

The Alberta Energy and Utilities Board

PREAMBLE

WHEREAS the Alberta Energy and Utilities Board (the AEUB) has statutory responsibilities pursuant to the *Alberta Energy and Utilities Board Act* and the *Energy Resources Conservation Act*, and

WHEREAS the Minister of the Environment, Canada (the Federal Minister) has statutory responsibilities pursuant to the *Canadian Environmental Assessment Act*, and

WHEREAS the Horizon Oil Sands Project (the Project) requires a public hearing and approvals from the AEUB pursuant to the *Alberta Energy and Utilities Board Act* and the *Energy Resources Conservation Act* and is subject to an assessment under the *Canadian Environmental Assessment Act*; and

WHEREAS the Minister of Fisheries and Oceans has referred the environmental assessment in respect of the Project to the Federal Minister in accordance with section 21 of the *Canadian Environmental Assessment Act*; and

WHEREAS the Federal Minister has referred the project to a review panel in accordance with section 29 of the *Canadian Environmental Assessment Act*; and

WHEREAS the Government of the Province of Alberta and the Government of Canada established a framework for conducting joint panel reviews through the *Canada-Alberta Agreement for Environmental Assessment Cooperation* signed on June 30, 1999; and

WHEREAS the AEUB and the Federal Minister have determined that a joint panel review of the Project will ensure that the project is evaluated according to the spirit and requirements of their respective authorities while avoiding unnecessary duplication, delays and confusion that could arise from separate reviews by each government; and

WHEREAS the AEUB and the Federal Minister have determined that a joint panel review of the Project should be conducted in a manner consistent with the provisions of the *Subsidiary Agreement on Joint Review Panels*, attached as Appendix 2 of the *Canada-Alberta Agreement for Environmental Assessment Cooperation*; and

WHEREAS the Federal Minister has determined that a joint review panel should be established pursuant to paragraph 40(2) of the *Canadian Environmental Assessment Act* to consider the Project;

THEREFORE, the AEUB and the Federal Minister hereby establish a joint review panel for the Project in accordance with the provisions of this Agreement and the Terms of Reference attached as an Appendix to this Agreement.

1. Definitions

For the purpose of this Agreement and of the Appendix attached to it,

"**Agency**" means the Canadian Environmental Assessment Agency.

"**EIA Report**" means an Environmental Impact Assessment report prepared in accordance with the Terms of Reference issued for the Project by the Director of Alberta Department of the Environment.

"**Environment**" means the components of the Earth, and includes
(a) land, water and air, including all layers of the atmosphere;
(b) all organic and inorganic matter and living organisms; and
(c) the interacting natural systems that include components referred to in (a) and (b)."

"**Environmental Effect**" means, in respect of the Project,
(a) any change that the Project may cause in the Environment, including any change it may cause to a listed wildlife species, its critical habitat or the residence of individuals of that species, as those terms are defined in subsection 2(1) of the *Species at Risk Act*,
(b) any effect of any change referred to in paragraph (a) on
    (i) health and socio-economic conditions
    (ii) physical and cultural heritage
    (iii) the current use of lands and resources for traditional purposes by aboriginal persons
    (iv) any structure, site or thing that is of historical, archeological, paleontological or architectural significance, or
(c) any change to the project that may be caused by the environment

whether any such change or effect occurs within or outside Canada.

"**Federal Authority**" refers to such an authority as defined in the *Canadian Environmental Assessment Act*.

"**Final Report**" is the document produced by the Joint Panel, which contains decisions pursuant to the *Energy Resources Conservation Act* and the Joint Panel's conclusions and recommendations pursuant to the *Canadian Environmental Assessment Act* with respect to the environmental assessment of the Project.

"**Follow-up Program**" means a program for

(a) verifying the accuracy of the environmental assessment of the Project, and

(b) determining the effectiveness of any measures taken to mitigate the adverse environmental effects of the Project.

"**Joint Panel**" refers to the joint panel established by the AEUB and the Federal Minister through this Agreement.

"**Mitigation**" means, in respect of the Project, the elimination, reduction or control of the adverse environmental effects of the project, and includes restitution for any damage to the environment caused by such effects through replacement, restoration, compensation or any other means.

"**Parties**" means the signatories to this Agreement.

"**Responsible Authority**" refers to such an authority as defined in the *Canadian Environmental Assessment Act*.

2. Establishment of the Panel

2.1. A process is hereby established to create a Joint Panel, pursuant to section 22 of the *Energy Resources Conservation Act* with the authorization of the Lieutenant Governor in Council of Alberta, and Sections 40, 41 and 42 of the *Canadian Environmental Assessment Act*, for the purposes of the review of the Project.

2.2. The AEUB and the Agency will make arrangements to coordinate the announcements of a joint review of the Project by both Alberta and Canada.

3. Constitution of the Panel

3.1. The Joint Panel will consist of three members. Two members, including the Joint Panel Chair, will be appointed by the Chair of the AEUB with the approval of the Federal Minister. The third Joint Panel member will be appointed by the Federal Minister in accordance with article 3.2 of this Agreement.

3.2. The Federal Minister will select the third Joint Panel member and recommend the selected candidate as an individual who may serve as a potential acting member of the AEUB. If acceptable to the Lieutenant Governor in Council of Alberta and the Chairman of the AEUB, the Lieutenant Governor in Council of Alberta will nominate this candidate to serve as an acting member of the AEUB and the Chairman of the AEUB will appoint this candidate as a member of the Joint Panel. The selected candidate will then be appointed by the Federal Minister as a member of the Joint Panel.

3.3. The Joint Panel members shall be unbiased and free from any conflict of interest relative to the Project and are to have knowledge or experience relevant to the anticipated Environmental Effects of the Project.

4. Conduct of Assessment by the Panel

4.1. The Joint Panel shall conduct its review in a manner that discharges the responsibilities of the AEUB under the *Alberta Energy and Utilities Board Act* and the *Energy Resources Conservation Act.*

4.2. The Joint Panel shall conduct its review in a manner that discharges the requirements set out in the *Canadian Environmental Assessment Act* and in the Terms of Reference attached as an Appendix to this Agreement.

4.3. All Joint Panel hearings shall be public and the review will provide for public participation.

4.4. The Joint Panel shall have all the powers and duties of a panel described in Section 35 of the *Canadian Environmental Assessment Act* and in Section 10 of the *Alberta Energy and Utilities Board Act.*

5. Secretariat

5.1. Administrative, technical, and procedural support requested by the Joint Panel shall be provided by a Secretariat, which shall be the joint responsibility of the AEUB and the Agency.

5.2. The Secretariat will report to the Joint Panel and will be structured so as to allow the Joint Panel to conduct its review in an efficient and cost-effective manner.

5.3. The AEUB will provide its offices for the conduct of the activities of the Joint Panel and the Secretariat.

6. Record of Joint Review and Final Report

6.1. A public registry will be maintained by the Secretariat during the course of the review in a manner that provides for convenient public access, and for the purposes of compliance with section 55 of the *Canadian Environmental Assessment Act*. This registry will be located in the offices of the AEUB.

6.2. On completion of the assessment of the Project, the Joint Panel will prepare a Final Report.

6.3. Once completed, the Final Report will be conveyed, in both official languages simultaneously, by the Joint Panel to the Government of Alberta, to the Federal Minister, the Minister of Fisheries and Oceans, and to the public.

6.4. Once the Final Report is submitted to the Federal Minister, the responsibility for the maintenance of the public registry will be transferred to the Responsible Authority. The AEUB will continue to maintain records of the proceedings and the Final Report, as per the AEUB Rules of Practice.

7. Other Government Departments

7.1. At the request of the Joint Panel, Federal Authorities and provincial authorities having specialist knowledge with respect to the Project will provide available information and knowledge in a manner acceptable to the Joint Panel.

7.2. Nothing in this agreement will restrict the participation by way of submission to the Joint Panel by other federal or provincial government departments or bodies, subject to article 7.1, above, section 12(3) of the *Canadian Environmental Assessment Act* and the AEUB Rules of Practice.

8. Participant Funding

8.1. Decisions regarding participant funding by the Agency under the federal Participant Funding Program, and decisions on intervener funding by the AEUB as provided for in the *Energy Resources Conservation Act*, AEUB Rules of Practice and the AEUB Guidelines for Energy Cost Claims (Guide 31A) will, to the extent practicable, take into account decisions of the other party.

9. Cost Sharing

9.1. The AEUB, as lead party, will develop a budget estimate of expenses agreeable to both parties prior to initiation of Joint Panel activities.

9.2. The costs of the review will be apportioned between the AEUB and the Agency in the manner set out in articles 9.3, 9.4 and 9.5.

9.3. The AEUB will be solely responsible for the following costs:

- salaries and benefits of the Joint Panel Chairman and the member of the Joint Panel not appointed in accordance with article 3.2; and
- salaries and benefits of AEUB staff involved in the joint review.

9.4. The Agency will be solely responsible for the following costs:

- per diems of the Joint Panel member appointed in accordance with article 3.2;
- salaries and benefits of Agency staff involved in the joint review;
- all costs associated with the federal Participant Funding Program; and
- French translation requirements.

9.5. The AEUB and the Agency agree to share equally all those costs listed below, incurred as part of the Joint Panel review from the signing of this Agreement to the date the Final Report is issued by the Joint Panel. The shareable costs are as follow:

- travel-related expenses associated with the review incurred by the Joint Panel members, and by AEUB and Agency staff in fulfilling the Secretariat functions;
- per diems and associated expenses of independent/non-government expert consultants or communications specialists retained by the Joint Panel;
- printing of any reports or documents distributed by the Joint Panel necessary for the Joint Panel's work;
- the publication of notices;
- photocopying and postage related to the review;
- production of one electronic and one paper copy of the transcripts prepared by court reporters as required by the Joint Panel;
- rental of hearing and public meeting facilities and equipment;
- sound services at the hearing and public meetings; and
- miscellaneous expenditures up to a maximum of 5 percent of the total budget for the review.

9.6. Shareable costs of the joint review as detailed in article 9.5 will be incurred at the sole discretion of the Joint Panel with due regard to economy and efficiency.

9.7. All expenses not listed above will need prior approval of both parties if they are to be equally shared.

9.8. To facilitate the delivery of payment of per diems of the Joint Panel member appointed in accordance with article 3.2 the AEUB will pay the individual in response to appropriate invoices and will invoice the Agency for the reimbursement of such payments.

10. Amending this Agreement

10.1. The terms and provisions of this agreement may be amended by written memorandum executed by both the Federal Minister and the Chairman of the AEUB. Subject to section 27 of the *Canadian Environmental Assessment Act*, upon completion of the joint review, this Agreement may be terminated at any time by an exchange of letters signed by both parties.

11. Signatures

WHEREAS the parties hereto have put their signatures this 18th day of August 2003.

<original signed by>	<original signed by>
The Honourable David Anderson Minister of the Environment Chairman	Neil McCrank Alberta Energy and Utilities Board

Appendix
Terms of Reference

Part I - Project Description

Canadian Natural Resources Limited (CNRL) is proposing to construct and operate an oil sands mining, extraction and upgrading facility in the Fort McMurray area, the Horizon Mine. The proposed project is located approximately 70 kilometres north of Fort McMurray in Townships 96 and 97, Ranges 11 to 13, West of the 4th Meridian. The proposed project includes an open pit, truck and shovel mine, four bitumen processing trains, three upgrading trains, associated utilities and infrastructure, water and tailing management plans, and an integrated development and reclamation plan. The project is designed to produce approximately 43 000 cubic metres per day of bitumen and approximately 37 000 cubic metres per day of upgraded bitumen product. Construction is scheduled to commence in 2004, initial production in 2007, and full production is expected by 2011.

Part II - Scope of the Environmental Assessment

1. The Joint Panel will conduct an assessment of the Environmental Effects of the Project based on the Project Description (Part I).

2. The assessment will include a consideration of the factors listed in subsection 16(1)(a) to (d) and 16(2) of the *Canadian Environmental Assessment Act*, namely:
   - **a)** The environmental effects of the Project, including the environmental effects of malfunctions or accidents that may occur in connection with the Project and any cumulative environmental effects that are likely to result from the Project in combination with other projects or activities that have been or will be carried out;
   - **b)** The significance of the effects referred to in paragraph a;
   - **c)** Comments from the public that are received during the review;
   - **d)** Measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the Project;
   - **e)** The purpose of the Project;
   - **f)** Alternative means of carrying out the Project that are technically and economically feasible and the environmental effects of any such alternative means;
   - **g)** The need for, and the requirements of, any follow-up program in respect of the Project; and
   - **h)** The capacity of renewable resources that are likely to be significantly affected by the Project to meet the needs of the present and those of the future.

3. Pursuant to subsection 16(1)(e) of the CEAA, the assessment by the Joint Panel will also include a consideration of the additional following matters:

   - **a)** Need for the Project;
   - **b)** Alternatives to the Project; and
   - **c)** Measures to enhance any beneficial Environmental Effects.

4. The Review will consider the Environmental Effects of the proposed Project within spatial and temporal boundaries which encompass the periods and areas during and within which the Project may potentially interact with, and have an effect on, components of the environment. These boundaries may vary with the issues and factors considered, and with the different phases in the life cycle of the project. The boundaries will reflect:

   - the natural variation of a population or ecological component;
   - the timing of sensitive life cycle phases in relation to the scheduling of the Project;
   - the time required for an effect to become evident;
   - the time required for a population or ecological component to recover from an effect and return to a pre-effect condition, including the estimated degree of recovery;
   - the area affected by the Project; and
   - the area within which a population or ecological component functions and within which a Project effect may be felt.

APPENDIX 3 HEARING PARTICIPANTS

Principals and Representatives (Abbreviations used in report)	Witnesses
Canadian Natural Resources Limited (CNRL)	
D. A. Holgate	P. Keele, P.Eng.
J. D. Brett	T. Dereniwski, P.Eng.
	J. Romero, P.Eng.
	C. Kean, P.Eng.
	R. Doucet, P.Eng.
	C. Duane, P.Ag.
	I. Mackenzie
	A. Takyi, Ph.D., P.Eng.
	N. Schmidt, Ph.D., P.Eng.
	S. McCutcheon, Ph.D.
	S. McKenzie, P.Biol.
	A. Beersing, Ph.D.
	T. Y. Gan, Ph.D.
	S. Swanson, Ph.D.
	M. Rawlings, P.Eng.
	T. Davidson, P.Geol.
	A. Thomson
	M. Ingen-Housz
Deer Creek Energy Limited (DCEL)	
D. Thomas, Q.C.	D. Theriault, P.Eng.
M. Ignasiak	M. Montemurro, P.Eng.
	D. Hackbarth, Ph.D., P.Geol.
Mikisew Cree First Nations (MCFN)	
D. Mallon	D. Schindler, Ph.D.
R. Salamucha	J. Byrne, Ph.D.
	J. Brownlee
	S. Kienzle, Ph.D.
	P. Komers, Ph.D.
	Chief A. Waquan
	W. Courtorielle
	S. Courtorielle
	R. McKay
	M. R. Waquan
	T. Marten
Oil Sands Environmental Coalition (OSEC)	
K. Buss	M. Kitagawa
	D. Woynillowicz
	A. Dort-McLean

(continued)

APPENDIX 3 HEARING PARTICIPANTS (continued)

Principals and Representatives (Abbreviations used in report)	Witnesses
Fort McKay First Nation and Metis Local 122 (Fort McKay)	
K. Buss	
S. Laurent	
Athabasca Chipewyan First Nation (ACFN)	
K. Buss	
L. Flett	
Fort McMurray Medical Staff Association (FMMSA)	
M. Sauvé, M.D.	
Marlboro Environmental Committee (MEC)	G. Brandenburg
G. Brandenburg	
Sierra Club of Canada (SCC)	
S. P. Stensil	
Dastous	
C. Dastous	C. Dastous
M. Dastous	M. Dastous
Shell Canada Limited (Shell)	
S. Denstedt	
K. Lozynsky	
Suncor Energy Inc. (Suncor)	
D. Thomas, Q.C.	
M. Ignasiak	
Imperial Oil Resources and ExxonMobil Canada (IOR)	
K. Sury	
Syncrude Canada (Syncrude)	
B. J. Roth	
D. Bercov	
UTS Energy Corp. (UTS)	
D. McDonald	

(continued)

APPENDIX 3 HEARING PARTICIPANTS (continued)

Principals and Representatives (Abbreviations used in report)	Witnesses
Birch Mountain Resources Ltd. (BMRL) D. Dabbs	
Government of Canada (Canada) B. Hughson D. Mueller	Environment Canada (EC) M. Fairbairn L. Bates-Frymel M. R. Norton B. Brownlee, Ph.D. D. Lindeman, Ph.D. Department of Fisheries and Oceans (DFO) D. Majewski A. Thomson, P.Eng. R. Courtney, P.Biol. B. Makowecki J. Shamess D. Walker W. Huber, Ph.D. Natural Resources Canada (NRCAN) G. R. Browning M. K. Cliffe
Her Majesty the Queen in Right of Alberta (Alberta) H. Veale D. Stepaniuk K. Sandstrom	D. Yoshisaka C. de la Chevrotiere, P.Eng. P. Marriott, P.Eng. M. Boyd R. Barrett K. Bodo, Ph.D. R. Chabaylo, P.Biol. L. Rhude, P.Biol. P. McEachern, Ph.D. K. Singh, P.Eng. C. Hale, RPF

(continued)

APPENDIX 3 HEARING PARTICIPANTS (continued)

Principals and Representatives (Abbreviations used in report)	Witnesses
Wood Buffalo First Nation (WBFN)	
J. Malcolm	R. S. J. Campbell
	W. Castor
	E. Cree
	R. Woodward
	D. McDonald
Chipewyan Prairie First Nation Industrial Relations Corporation (CPFN)	
B. Kennedy	
Alberta Energy and Utilities Board (EUB) staff	
G. Perkins, Board Counsel	
R. Germain, P.Eng.	
K. Geekie	
B. Austin, P.Geol.	
M. Dmytriw, R.E.T.	
J. Farnell, C.E.T.	
C. Brown. P.Biol.	
T. Lemay	
K. Johnston	
Canadian Environmental Assessment Agency (CEAA) staff	
S. Chapman	

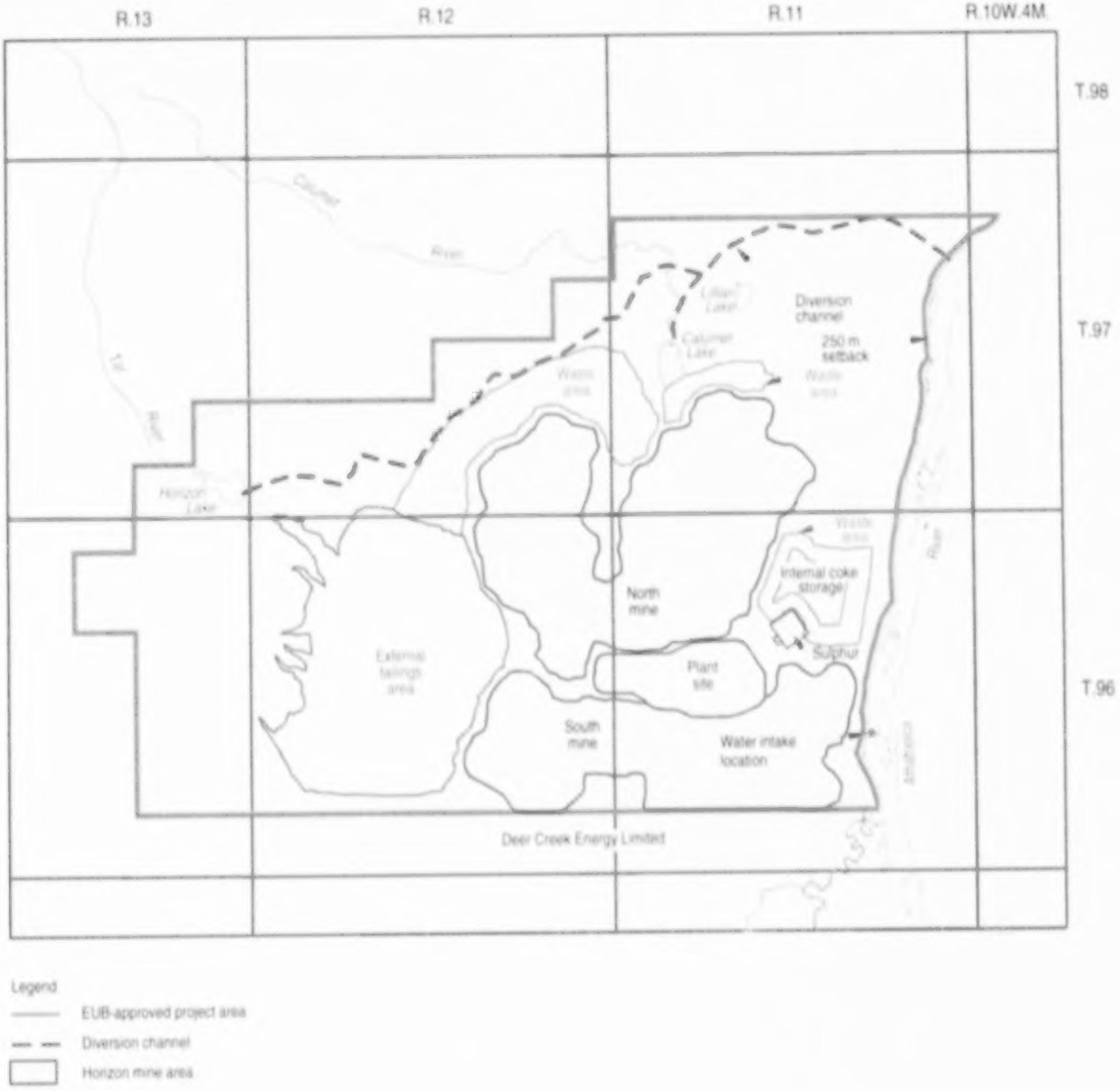
R.13
R.12
R.11
R.10W.4M.
T.98
T.97
T.96
Calumet River
Tar River
Horizon Lake
Lillian Lake
Calumet Lake
Diversion channel
250 m setback
Waste area
Waste area
Waste area
Internal coke storage
Sulphur
North mine
External tailings area
Plant site
South mine
Water intake location
River
Athabasca
Deer Creek Energy Limited
Legend
EUB-approved project area
Diversion channel
Horizon mine area

Figure 1. Horizon oil sands project area